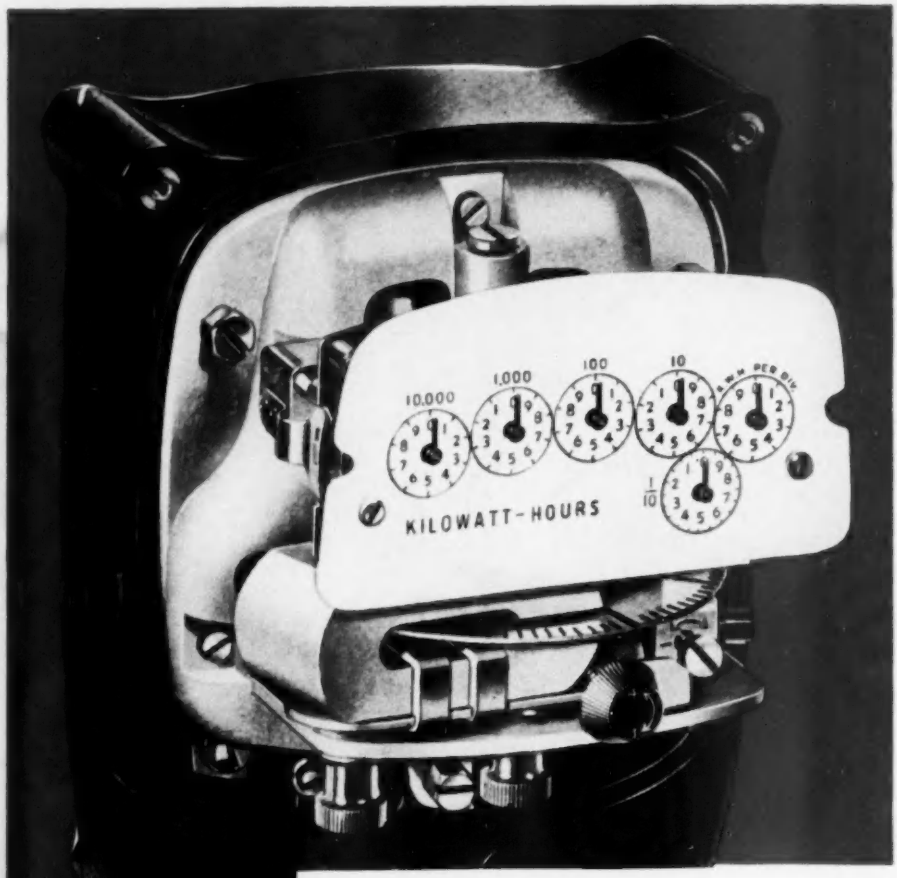
ELECTRICAL TIMES

THURSDAY
14 SEPT.
1950
SIXPENCE

F
FERRANTI
Ferranti Instruments, Meters, Transformers and Power Factor Correction Condensers installed in a Sub-station of an Engineering Works
FERRANTI
FERRANTI LTD., Hollinwood, LANCS.
London Office: Kern House, Kingsway, W.C.2
FG97a



Crompton

HOUSE SERVICE METERS

CROMPTON PARKINSON, LTD., (PLANT DIV.)
CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2.

AS CERTAIN AS THE COMING OF SPRING

If the mains should fail, the **Nife-Neverfayle emergency lighting equipment** will instantly, automatically flash into action with complete reliability. That is the special advantage of the NIFE battery. For a NIFE battery will not deteriorate even during months of inactivity—its electrolyte is almost inert. A NIFE battery can stand up to rough handling and neglect—it is made principally of steel. And finally, a NIFE battery's first cost is almost its last cost—it needs practically no attention. Hospitals and cinemas all over the world have already installed Nife-Neverfayle emergency lighting equipment.

N.17

NIFE-NEVERFAYLE

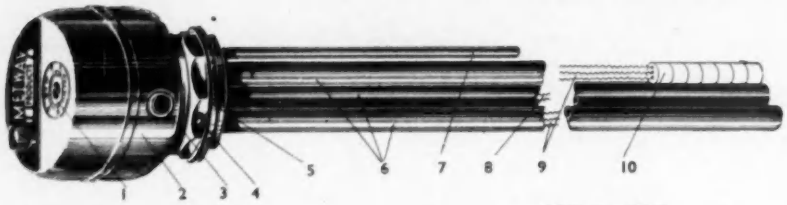
THE EMERGENCY LIGHTING EQUIPMENT

with the STEEL battery

NIFE BATTERIES · REDDITCH · WORCESTERSHIRE

METWAY PRODUCTS
Registered Trade Mark

IMMERSION WATER HEATER
WITH SATCHWELL Thermostatic Control
Fully Guaranteed for Two Years



1. Satchwell Thermostat Adjustment.
2. Robust Aluminium Case.
3. Bushed Cable Entry.
4. Earth Screw.
5. Jointing Washer.
6. Tube pressure tested at 90 lb. per square inch.
7. Thermostat Tube.
8. 1 kW Element.
9. Two 1,500 W pure nickel-chrome Elements.
10. Removable Refractories.

PROMPT DELIVERY

A request on your business letter heading will bring you a copy of our LIST No. MY1/8"T.E."

12" to 42"
Standard Range 2, 3 and 4 kW

IMMERSION TYPE KETTLE ELEMENTS
Full range detailed in LIST No. ALI/27. Ask for a copy.

METWAY ELECTRICAL INDUSTRIES LTD.
KING STREET, BRIGHTON 1, SUSSEX
Telephone : Brighton 28366 P.B.X. (7 lines).
Cables : "Metway, Brighton."

ENGINEERS

★ FREE BROCHURES ★

Technical training is vital to your success. Our Home Study courses bring you sound, up-to-the-minute instruction.

Write or 'phone for FREE BROCHURES detailing our courses of TECHNICAL TRAINING IN ALL BRANCHES OF ENGINEERING covering such degrees as A.M.I.Mech.E., A.M.I.E.E., A.M.I.P.E., City and Guilds, etc.

"THE COLLEGE BACKED BY AN INDUSTRY"

Write to Dept. 147.

E.M.I. INSTITUTES
10, PEMBRIDGE SQUARE, NOTTING HILL GATE, LONDON W.2. TELEPHONE: BAYSWATER 5131/2
Associated with "H.M.V." MARCONIPHONE COLUMBIA ETC

I.12

ASBESTOS WOVEN WIRE RESISTANCE NETS

COST SO LITTLE & HELP SO MUCH

Write or telephone today for full details, and technical advice if required.

CRESSALL

registered Trade Name of
The Cressall Manufacturing Co. Ltd.
Tower Street, Birmingham 19.
Telephone: ASTon Cross 2666 (3 lines).
Telegrams: "OHMIC," Birmingham.

One . . . the job for which it has been designed and manufactured; for which the metal has been carefully selected and tested, and the appropriate tooling and heat-treatment controlled by expert craftsmen; for which the finished spring is rigidly inspected and finally despatched to the customer who ordered it for his own specific purpose. That's how a spring is produced for the job, by

SALTER
(EST. 1760)

GEO. SALTER & CO. LTD., WEST BROMWICH

in the baby show

And *what* a baby. The Baby Belling has an oven capacity of 1,943.5 cubic inches—which in housewives' language means the largest joint, with its attendant roast "spuds", a Yorkshire pudding, and the "afters" in the shape of a fruit pie, flan or tart, all cooked comfortably in the oven for the same meal. And that's not all. On top is a grill-boiling plate 10½" x 8" for three or four saucepans, while the grill takes two big kippers or plenty of toast. Then there's a large compartment under the oven for keeping plates and meals hot. The Baby Belling will regularly cook all the meals for a family of two or three, and can cope successfully with larger numbers when occasion demands. Some baby!

LIST NO. 45A BABY BELLING COOKER
£12 . 10 . 0. Consumption: Full-on 3.2 kw.
Overall size: 18" wide x 15½" deep x 20" high. Weight: 71 lbs.
Finishes: White vitreous enamel with black vitreous hob.
Two-tone cream with black vitreous hob, 5/- extra.
AVAILABLE ON STAND (40/- extra) OR CABINET (80/- extra).
Simmerstats can be fitted in place of "Three-heat" switches at 15/6 each.

You can't beat a 'Belling'

ALL ORDERS CAN NOW BE FULFILLED PROMPTLY

BELLING & CO. LTD., BRIDGE WORKS, ENFIELD, MIDDLESEX

CRC 345

THE Directors and Staff of Everett Edgcumbe and Co. Ltd. wish to express their grateful thanks to all those who came to their aid after the fire which destroyed part of the Colindale Works on August 26.

THIS assistance, which came from all sections of the industry, was immediate and most generously proffered. It is largely due to this that both those parts of our organisation which were affected, and the larger untouched portion, were already in action again within a few days. All employees reported for duty after the fire in the normal manner, and were without exception, immediately found work.

THE spontaneous help which we have received has enabled us successfully to bridge the gap in production which the fire caused.

EVERETT EDGCUMBE

Makers of Electrical Instruments, indicating, recording and controlling; Photometric apparatus; process controls.

COLINDALE WORKS, LONDON, N.W.9. TEL.: COLINDALE 6045

DHB

LEADING

the FIELD

with a new streamlined design of charger for handbarrows and electric vehicles, combining the same old reliability and efficiency with elegance. For details

WESTINGHOUSE

WESTALITE VEHICLE CHARGERS

Write for Data Sheet No. 26 to Dept. E.T.20

WESTINGHOUSE BRAKE & SIGNAL CO. LTD.

82 York Way, King's Cross, London, N.1.

Crompton go to new lengths with "Mellow" Light

Crompton " Mellow " fluorescent lamps have caught on so well that they are now made available in three new sizes. They are :

	LIST PRICE	PURCHASE TAX EXTRA
15 watt, 18 inch	11/6	3/-
20 watt, 24 inch	12/6	3/3
30 watt, 36 inch	13/-	3/5

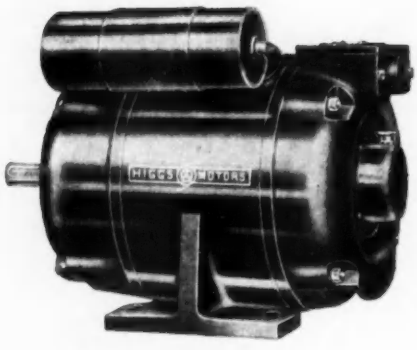
Now nearly all fluorescent lighting users can enjoy this good-natured light which puts a cheerful complexion on foods and faces. All lamps fit existing fittings and work on the same control gear.

SWITCH TO Crompton

BY APPOINTMENT MANUFACTURERS OF ELECTRIC LAMPS TO H.M. THE KING

CROMPTON PARKINSON LTD. · CROMPTON HOUSE · ALDWYCH LONDON · W.C.2

HIGGS MOTORS LTD.
WALTER F. HIGGS, M.I.E.E.
BIRMINGHAM 6 ENGLAND



HIGGS FRACTIONAL H.P. MOTORS

Our comprehensive range of split-phase, capacitor start, repulsion-induction, etc., is fully detailed in Leaflet 102. Specify the motor that is

GUARANTEED FOR EVER

Belfast, Birmingham, Bristol, Dundee, Glasgow, London, Manchester, Newcastle, Peterborough, Sheffield, Wolverhampton

C.M.A.-CABLES

In the air, on sea or on land, all scientific triumphs call for the finest and most reliable equipment.
Therefore when cables are required, always specify

C.M.A.

MEMBERS OF THE C.M.A. & AFFILIATED MANUFACTURERS' ASSOCIATIONS

British Insulated Callender's Cables Ltd.
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The Craigpark Electric Cable Company Limited.
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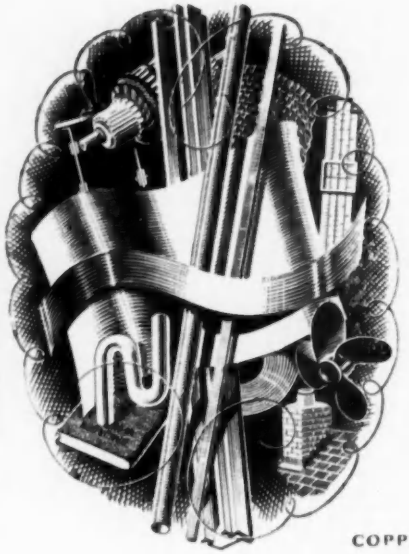
Johnson & Phillips Limited.
Liverpool Electric Cable Company Ltd.
Metropolitan Electric Cable & Construction Co. Ltd.
Pirelli-General Cable Works Limited (The General Electric Co. Ltd.).
Siemens Brothers & Company Limited (Siemens Electric Lamp & Supplies Limited).
St. Helens Cable & Rubber Company Ltd.
Standard Telephones & Cables Limited.
The Telegraph Construction and Maintenance Co. Ltd.

MAINS CABLE MANUFACTURERS ASSOCIATION
MAINS CABLE MANUFACTURERS ASSOCIATION (SUPER-TENSION)
RUBBER & THERMOPLASTIC CABLE MANUFACTURERS ASSOCIATION
Affiliated to
CABLE MAKERS ASSOCIATION
52-54 High Holborn, London, W.C.1. Tel: Holborn 7633

G 56



Helping COPPER to help the nation

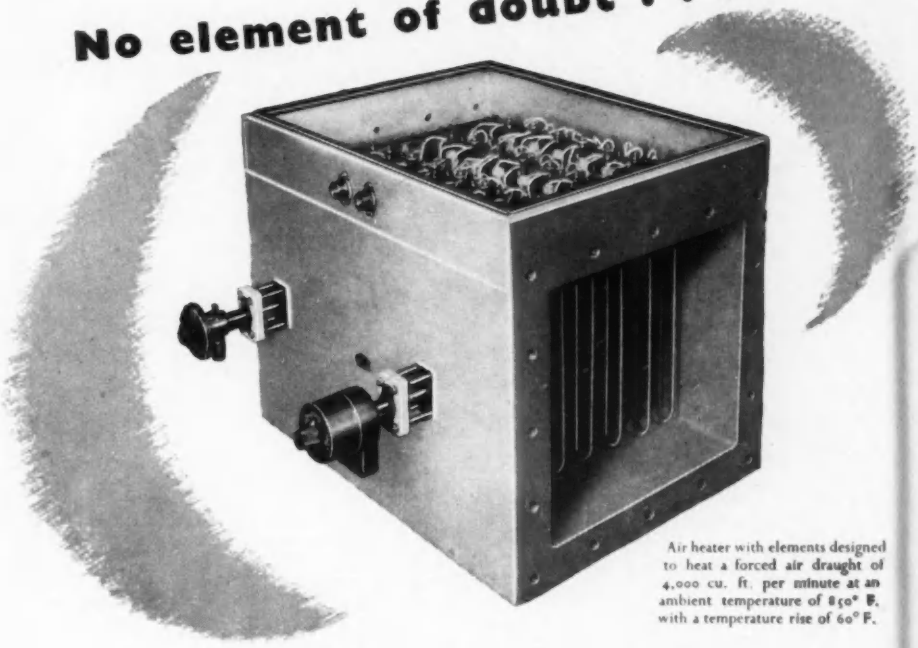
COPPER DEVELOPMENT ASSOCIATION exists to promote the wider and more efficient use of copper and its alloys and to bridge the gap between technical developments and their practical application in industry. The C.D.A. is backed by the resources of the whole British copper industry and is in a unique position to help copper to help you, no matter what your interest may be.

The Association, which is a non-trading organisation, can tell you what copper and its alloys can or cannot do and how they can be used to the best advantage. Its services are available to all entirely free of charge or obligation. You have only to ask.

COPPER DEVELOPMENT ASSOCIATION · KENDALS HALL · RADLETT · HERTS · RADLETT 5616

This is the first of a series of six advertisements on Metrovick Industrial Heating Elements

No element of doubt . . .



Air heater with elements designed to heat a forced air draught of 4,000 cu. ft. per minute at an ambient temperature of 850° F. with a temperature rise of 60° F.

. . . with Metrovick Elements

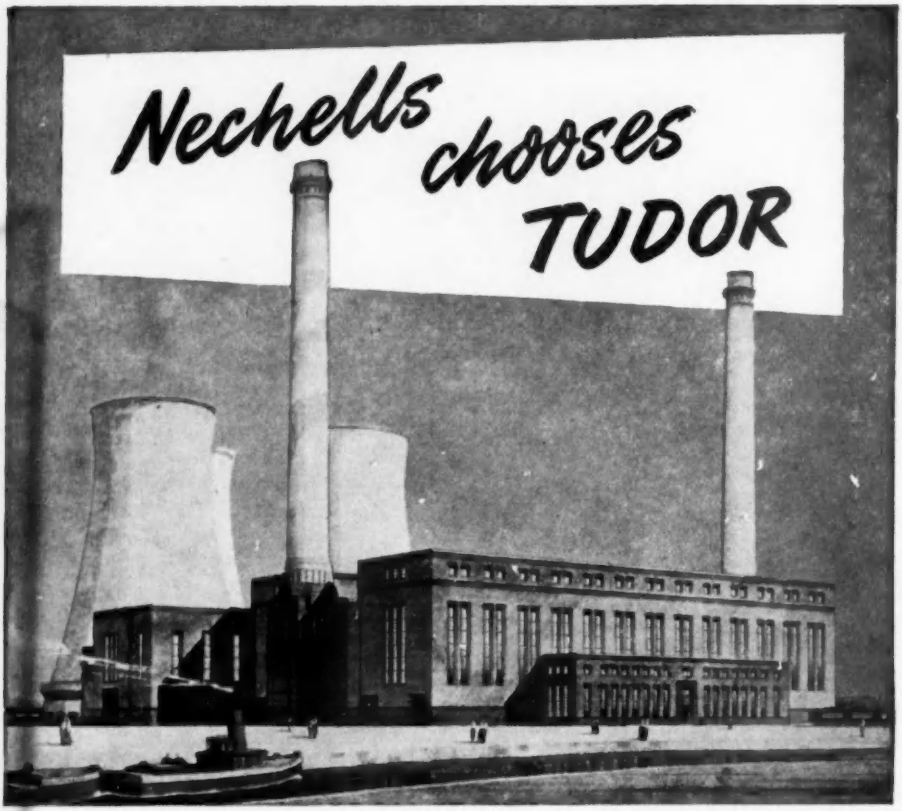
AIR HEATING

The Metrovick tubular sheathed heating element — as used in the famous "Redrings" for domestic electric cookers — can solve many heating problems in industry. Elements can be supplied suitable for operating in air temperatures of up to 600° C. The construction of the element is such that the outer sheath, which may be supplied in a variety of materials, protects the inner winding from dirt, damp and possibly corrosive conditions, thus ensuring a long trouble-free life under arduous conditions. We can also supply complete air heaters as illustrated. Send for descriptive leaflet 7703/1.

METROPOLITAN-VICKERS ELECTRICAL CO. LTD., TRAFFORD PARK, MANCHESTER 17
Member of the A.E.I. Group of Companies

METROVICK *"Redrings" for domestic use*

L/5003



Nechells' new Power Station, Birmingham, like other great projects will rely on Tudor batteries. In this it follows the example of many others of Britain's new Power Stations where every item of equipment is rigidly selected on merit.

Please write for publications Nos. 66A/2 & 69D/2.

Duplicate batteries will be installed each consisting of 115 cells in open glass boxes, having a capacity of 600 ampere-hours at the 10 hour discharge rate. The batteries will be used for supplying emergency lighting circuits, indicating, closing and tripping circuits of the main 11 Kv. switchgear and the 3.3 Kv. and 415 volts works supply switchgear.

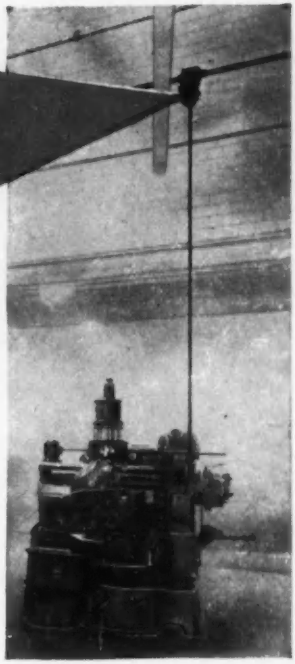
Tudor

BATTERIES

THE TUDOR ACCUMULATOR CO. LTD.,
50 GROSVENOR GARDENS, LONDON, S.W.1

T.78

(British Patent No. 544,515)



Make your machine-shop power supply FLEXIBLE

New type "Pull-Cap" Fuse Carriers and Bases

Fuse base contacts are shielded by insulating cover plates which ensure safe operation, and replacement of fuse-links is facilitated.

(British Patent No. 577848)

Simplify alterations and additions to your machine-shop layout without interruption of supply by using BICC Detachable Fused Tee Boxes. Easily installed along a cable run, they offer a feed-point system which is adaptable, simple, safe and economical.

Assembly consists of a main Cable Chamber and a readily attachable Fuse Box, rated up to 60 amps. These Fused Tee Boxes are designed for mains cables up to ·15 sq. in. with or without conduit and are equally suitable for new or existing work.

B.I. Callender's

DETACHABLE FUSED TEE BOXES

BRITISH INSULATED CALLENDER'S CABLES LIMITED
NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2

Visit our Stand
No. 28
at the A.P.L.E. Exhibition,
Bournemouth,
Sept. 18—22.

'Half-night' Control

for fluorescent Street Lighting

In addition to normal dusk and dawn switching 'half-night' control of modern multi-tube fluorescent lighting units is readily effected by the Venner Time Switch Type MSDC.
This switch includes the requisite double-circuit control to allow one or more tubes in a unit to be cut out at a pre-determined hour, usually between 11 p.m. and 1.0 a.m. and incorporates a solar dial. Models may be supplied with handwound or synchronous motor driven clocks as desired. Also available for double pole applications.

WRITE FOR LEAFLET T.S.25/ET

We also specialise in Process Timers, Programme Ringers, Stop Watches, Hour Recording Meters, Prepayment and House Service Meters, Delay Relays and Master Pendulum Clocks.

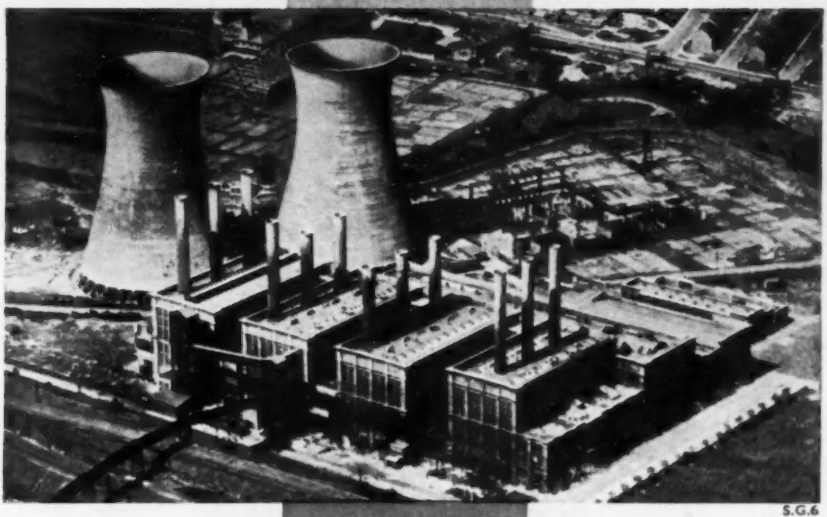
There is a VENNER *time switch for every purpose!*

VENNER Time Switches Ltd.

KINGSTON BY-PASS, NEW MALDEN, SURREY.

Telephone : MALden 2442 (9 *lines*)

POWER IN THE MAKING



S.G.6

No. 6—Kirkstall Generating Station

There is combustion history in the development of pulverised fuel equipment at this important station. When the plant was designed in 1927 it was considered that a coal carbonisation plant might be installed in conjunction with a central system of powdered coal preparation. This possibility influenced the plant layout.

Coal for the first two boiler houses is pulverised in another building by Raymond vertical roll mills with separately fired dryers. The powdered coal is transported in aerated form to storage bunkers near the boilers.

In later installations, however, the unit system with mill drying is in use, giving a more compact layout. The third boiler house has Impax high speed mills and the fourth, opened in 1948, four LM medium speed roll mills with each of the three boilers. Burners are the short flame, turbulent flow type, placed two in each side wall of the furnace and horizontally opposed. The furnace itself is of modern, fully-cooled design.

To-day at nearby Skelton Grange, even larger 'International' radiant heat boilers with adjustable tangential firing are being built. They, in turn, will be followed by still larger steam generators for unit coupling to 60,000 kW sets giving an ultimate capacity of 260,000 kW.

ICL

INTERNATIONAL COMBUSTION LTD

London Office: NINETEEN WOBURN PLACE, W.C.1

Works: DERBY, ENGLAND; PORT ELIZABETH, SOUTH AFRICA; SYDNEY, AUSTRALIA

3 IMPORTANT CONTRACTS at 132 kV

ENFIELD Pipe Line Compression Cable for 132 and 275 kV.

The British Electricity Authority have recently awarded Enfield three important Contracts at 132kV.

These are:—

1. **20,000 yards of Pipe Line Compression Cable at 132kV for installation between Braehead Power Station, Govan, Haggs Road, at Glasgow.**
2. **6,500 yards on the Portsmouth Wymering 132kV System.**
3. **2,390 yards near the City of Bedford.**

Super Tension Cables of accepted design are all technically efficient, but the pipe line compression cable is the cheapest of them all. Three single core 132kV Cables, each paper insulated and lead covered, are contained in a steel pipe, and subject to a gas pressure of 200 pounds per square inch — that is all.

Because of this simplicity and low cost, pipe line compression cables are now being considered for many super tension schemes throughout the world.

ENFIELD CABLES LIMITED

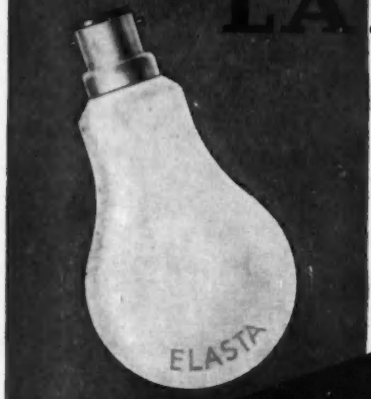
BRIMSDOWN, MIDDLESEX

HOWard 2661 (Works) London Office: HOLborn 0591

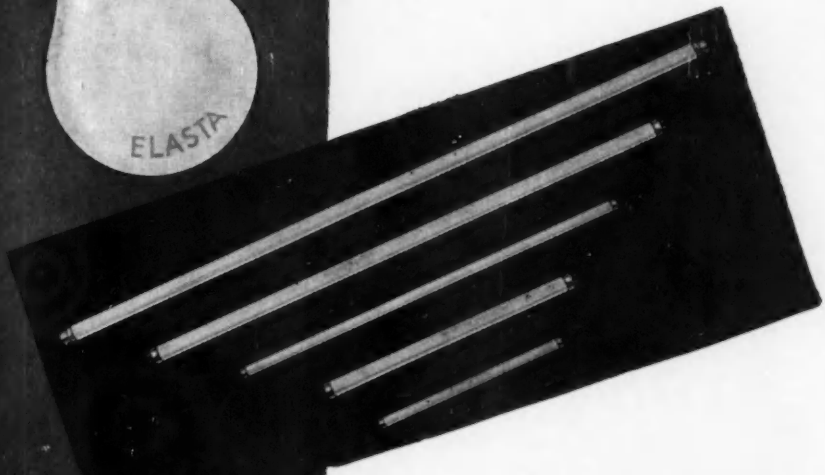
BELFAST, BIRMINGHAM, BRIGHTON, BRISTOL, CARDIFF, GLASGOW, HULL, IPSWICH LEEDS, MANCHESTER, NEWCASTLE, NOTTINGHAM, SELBY, SOUTHAMPTON and throughout the world.

Elasta

LAMPS



MADE IN
ENGLAND



All Fluorescent lamps are supplied in NATURAL and WARM WHITE colours. The 5 ft. and 4 ft. lamps are also available in DAYLIGHT colour.

POPE'S ELECTRIC LAMP CO. LTD.

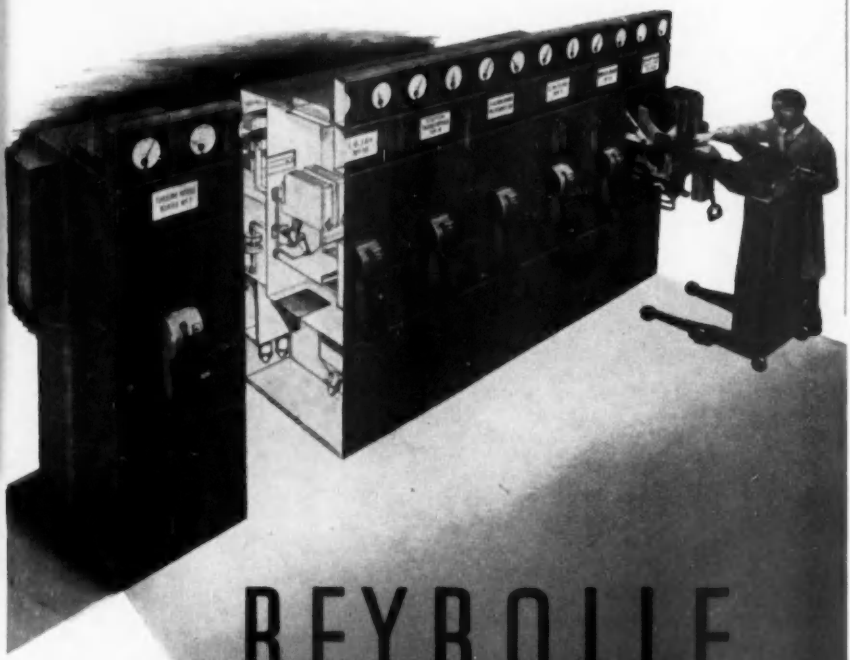
Head Office: 5 EARNSHAW ST., NEW OXFORD ST., LONDON, W.C.2

Branches: MANCHESTER, LEEDS, LEICESTER, BIRMINGHAM, BRISTOL, BELFAST (Northern Ireland)

AIR-BREAK

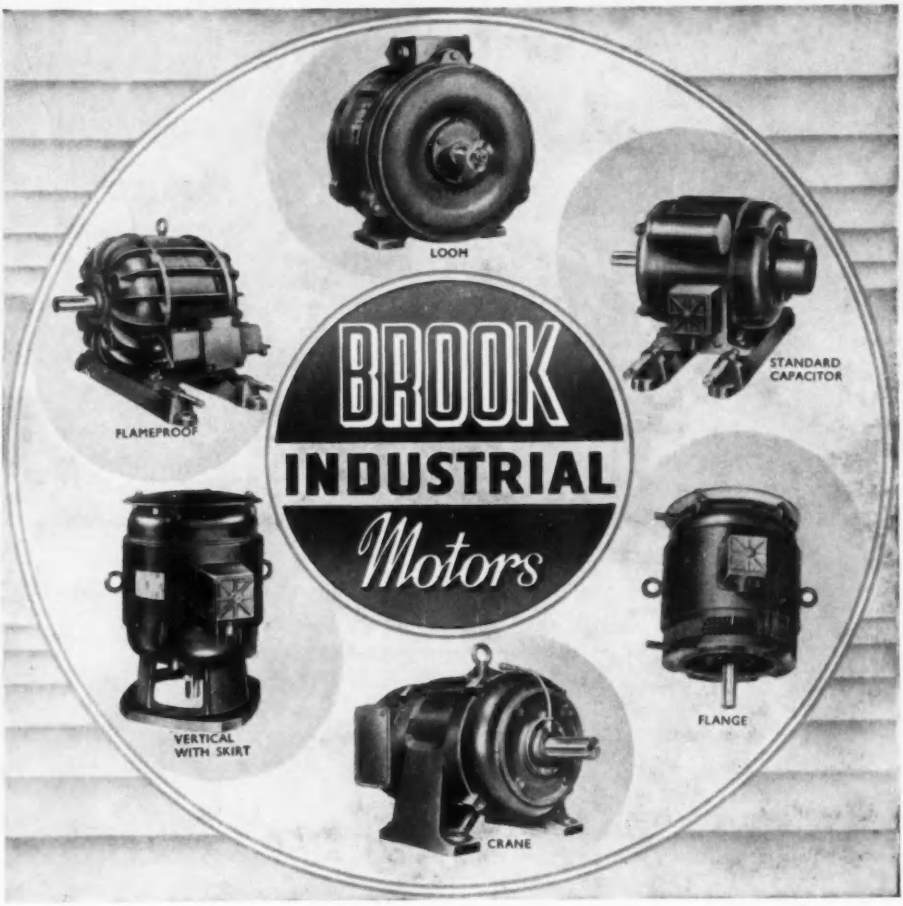
CLASS-SA SWITCHGEAR

★ Air-insulated
★ Metal-enclosed
★ Medium-voltage
★ 800, 1200, 1600 and 2400 Amperes



REYROLLE

HEBBURN ★ CO. DURHAM ★ ENGLAND



For cranes, lifts, pumps, looms, mine machinery and a host of other purposes there is a suitable type in the Brook motor range. However hard the work or hazardous the conditions—you can rely on a Brook motor.

Fractional and Industrial Motors from 0.25 to 200 h.p.

EMPRESS WORKS BROOK MOTORS Ltd HUDDERSFIELD

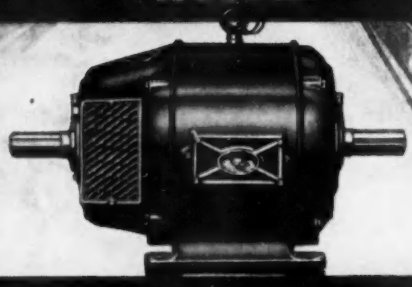
I.HA.109

CONVEYING & LIFTING

Power by HOWELLS

LIFT CRANE & HOIST MOTORS

Of robust construction to withstand arduous duties, ½ hr. or 1 hr. rated, they develop 200% of full load torque at starting. Available for early delivery in protected or totally enclosed types complying fully with B.S.S.

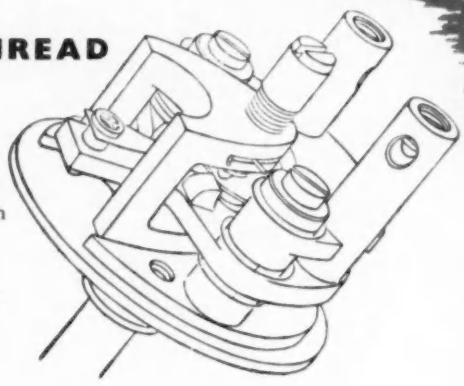


HOWELLS
(ELECTRIC MOTORS) LTD
HANLEY. STOKE-ON-TRENT

Branches at LONDON MANCHESTER BRISTOL BIRMINGHAM GLASGOW

dm HE29

LIFE
HANGS ON A THREAD



Once it's happened you bear it—but what *might* happen always nags a bit. Those screw contacts hidden away in a water-heater thermostat, for instance? *In the Sunvic we make the electrical circuit all-in-one.* And the little switch that toys with your reputation perhaps 10,000 times a year? *Nice to remember it's that positive-action* SIMMERSTAT *type.* Creeping calibration can be another good-will nibbler — but, again, *not with Sunvic.* Prices are now reduced.

Better feel sure; better fit—

SUNVIC

Sunvic Controls Ltd., 10 Essex Street, W.C.2

The WATER HEATER THERMOSTAT
with the positive-action switch.

Domestic temperature controls

TAS. SC. 247

Distinguished Lighting Fittings in Aluminium Alloy

LIST NO. S.W.10/1G.R. 100 WATT

MANUFACTURED BY

J. & G. COUGHTRIE LTD.,

HILLINGTON, GLASGOW S.W.2.

STOCKED BY ALL LEADING ELECTRICAL WHOLESALERS

These showroom conversations are selling Burco Boilers

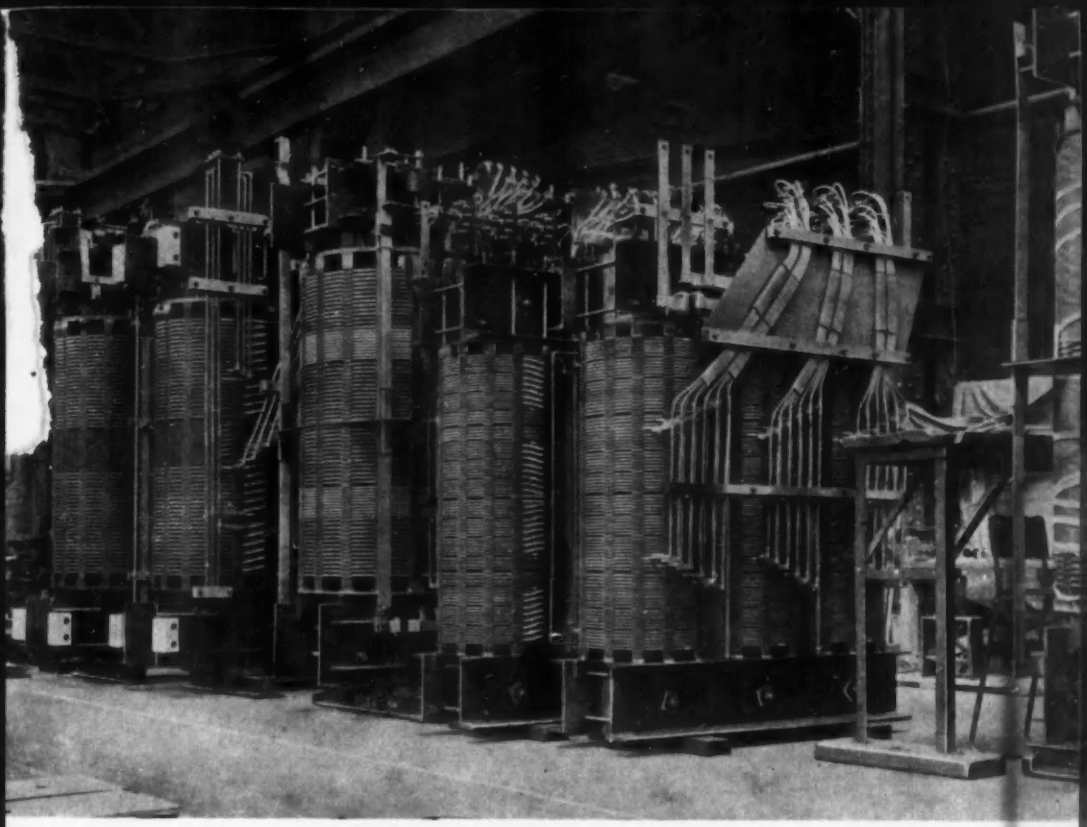
Regular display advertisements are appearing in a long list of the most influential journals appealing to practical women. They reach a combined audience of over 7 MILLION READERS

"Madam I have no hesitation in recommending the
"You can't go wrong with the Burco Electric Wash Boiler"
"Quite right Madam you must have a Burco Electric Wash Boiler"
My advice Madam is Buy a Burco Electric Wash Boiler
and make washday easier
Burco
ELECTRIC WASH BOILERS
BURCO LTD., ROSE GROVE, BURNLEY
Specialists in Electrical Washday Appliances
GROVE, BURNLEY

Show your Burco boilers. Link up with the thousands who are asking for the "name of the nearest dealer." Keep up your stocks and seize this opportunity for increased sales.

ELECTRIC
WASHBOILER
CAT NO *E840*

BURCO LTD · ROSE GROVE · BURNLEY · LANCS.

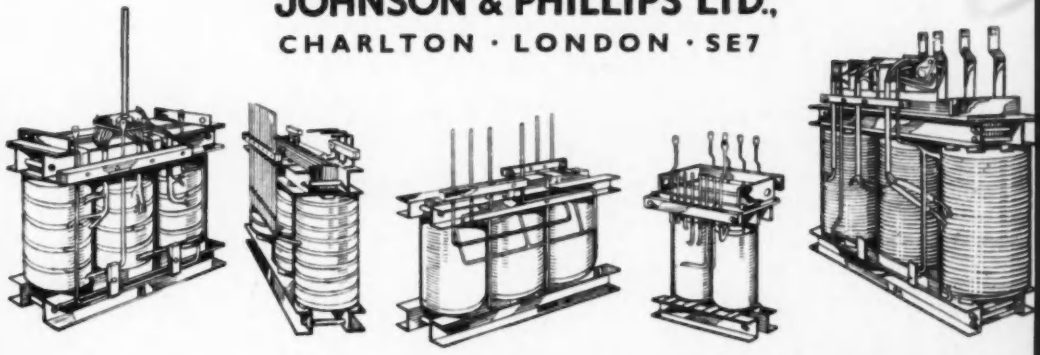


NOT ALL MVA's

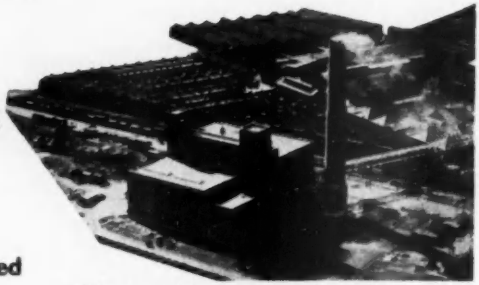
Not all the transformers we build are measured in MVA, but our reputation for building transformers with "plenty to spare" certainly seems to be attracting a lot of large jobs our way. The three 15 MVA units on the left are for the B.E.A.; the two 4 MVA units in the centre are for the N.C.B.; while the 10 MVA unit just showing on the right is for Australia. When you're needing a big unit - or a little one - it's worth remembering that a J.& P. transformer has "plenty to spare."

JOHNSON & PHILLIPS LTD.,

CHARLTON · LONDON · SE7



Dionic Purity Meters in famous Linoleum Mills



Make-up and Condensate examined at new generating station

Three separate installations of Dionic Water Purity Meters have been incorporated in the new thermal-electric generating station which Jas. Williamson & Son Ltd., the linoleum and coated fabric manufacturers, have brought into operation at Lune Mills, Lancaster.

Two Dionic meters installed in the boiler house indicate the purity of condensate returns at various sampling points, and give immediate warning of any change in conductivity. The third forms part of the water treatment plant where the River Lune water, unfit in its raw state for boiler feed purposes, is treated prior to use as make-up. Conductivity readings are taken of the treated water and also of condensate returns from process steam used in the factory.

Each Dionic meter consists of a mixing chamber with four inlets from different sampling points, a conductivity tube through which samples of the water are continually flowing, and an indicator with alarm bell. Should the conductivity at any time exceed a pre-determined figure, the alarm bell rings and the attendants take appropriate action.

Indicators for the three Dionic meters form part of the main boiler and turbine panel which carries a record of all principal measurements for the operation of the station.

Publication J 216 carries full details of Dionic Water Purity Meters.

The Day's Work

At the works of The Rugby Portland Cement Company Limited the Evershed Recorder charts form a 'useful record of the day's working' and they check power consumption, whether plant runs to schedule, and when a machine can be put on extra duty without increasing the maximum demand.

Megger Testers in Scottish Highland Hydro-Electric Schemes

Megger Earth Testers have been 'extremely useful' in the operations of the North of Scotland Hydro-Electric Board. They are employed for testing earths being installed at the various hydro and diesel stations, for testing substation earths, and also for testing earthing systems in villages where water mains are not available as earths. The Board have also used Megger Earth Testers for carrying out specific resistivity tests along the routes of the new 132 kV and 33 kV overhead lines.

Send for Publication J 051/20, 22 and 25.

The Experts choose Dionic Testers

When a leading manufacturer of water treatment plant chooses Dionic Purity Meters, that's a fair test. For ten years the Permutit Company Ltd. have used Dionic equipment in their experimental laboratories at Chiswick. In the Analytical Laboratory, 300 samples of raw water a month are examined with a portable Dionic instrument, which has proved extremely valuable for indicating the amount of total dissolved solids. A pilot water treatment plant has been erected for experimental purposes in the Testing Laboratory. Here the Dionic equipment comprises a permanently installed portable instrument as well as two water tube units, an indicator and triplex recorder, enabling the continuity of the processed water to be under constant examination.

Send for Publication J 216.

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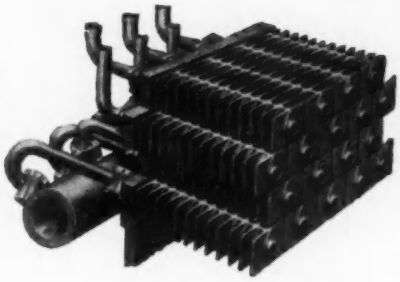

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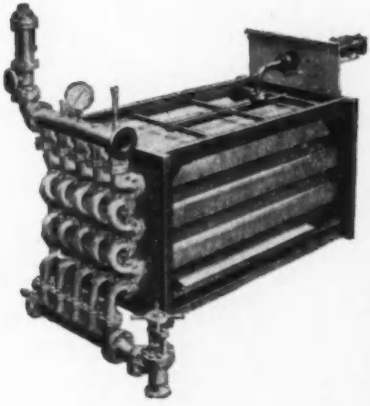

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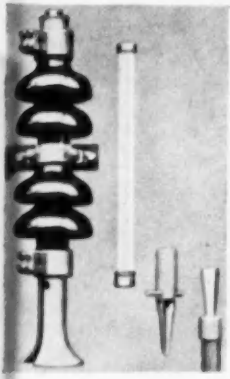

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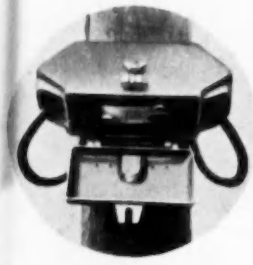

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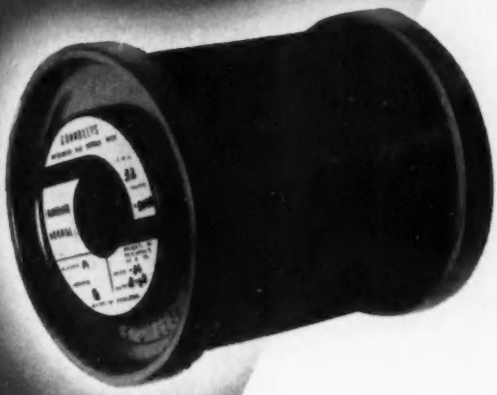

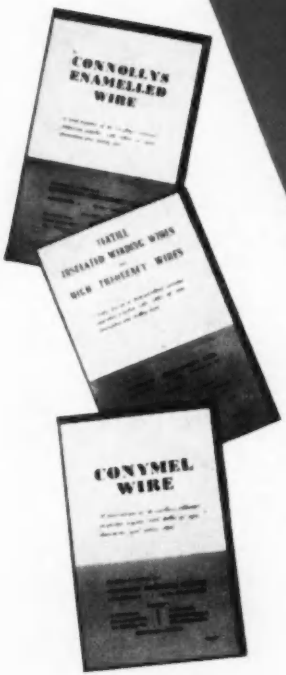

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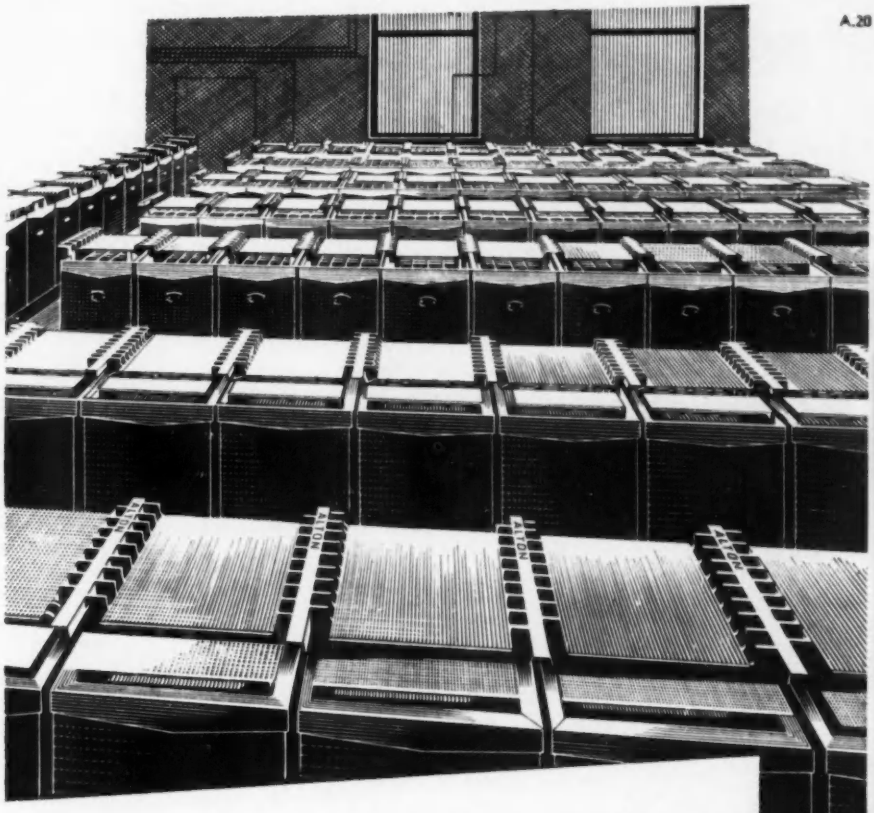

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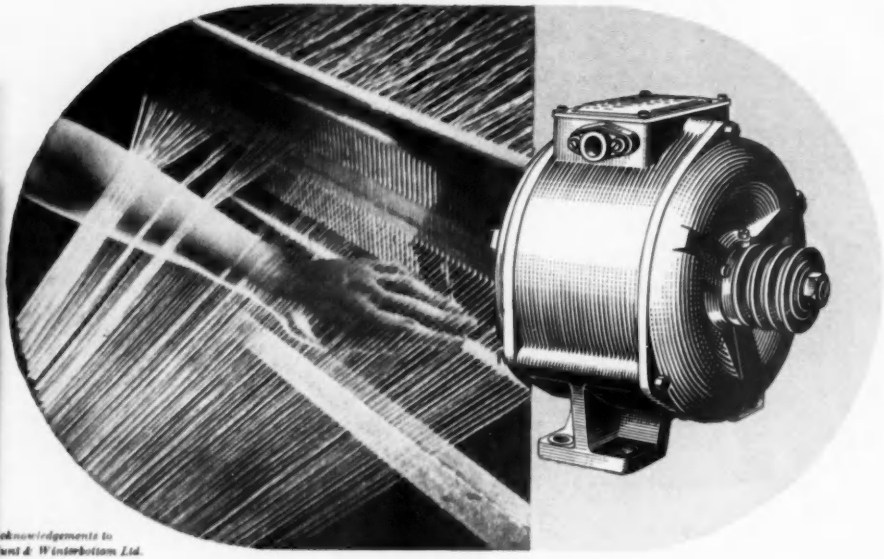

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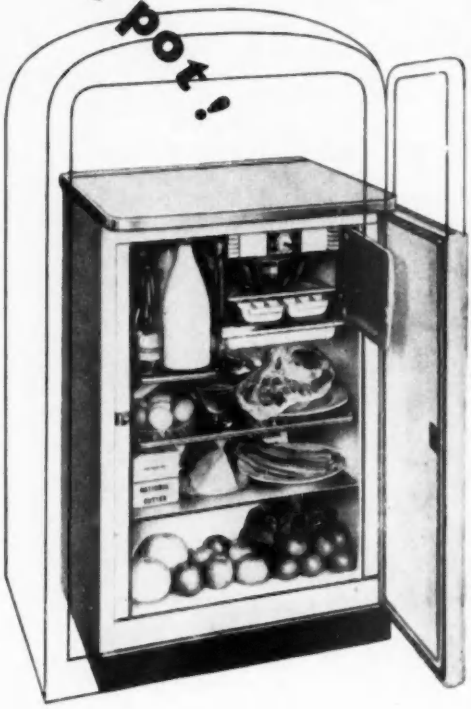

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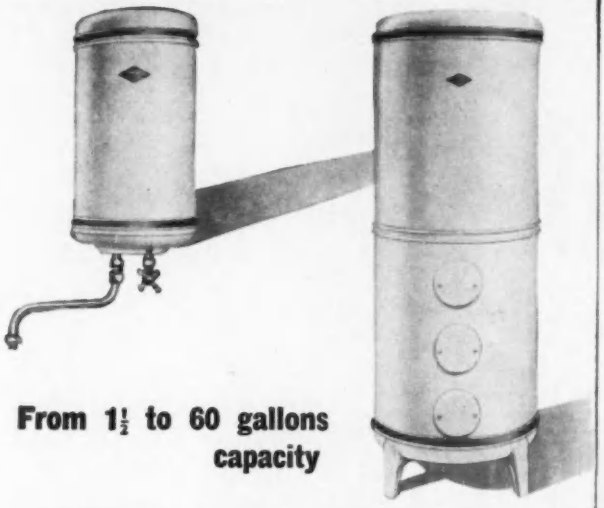

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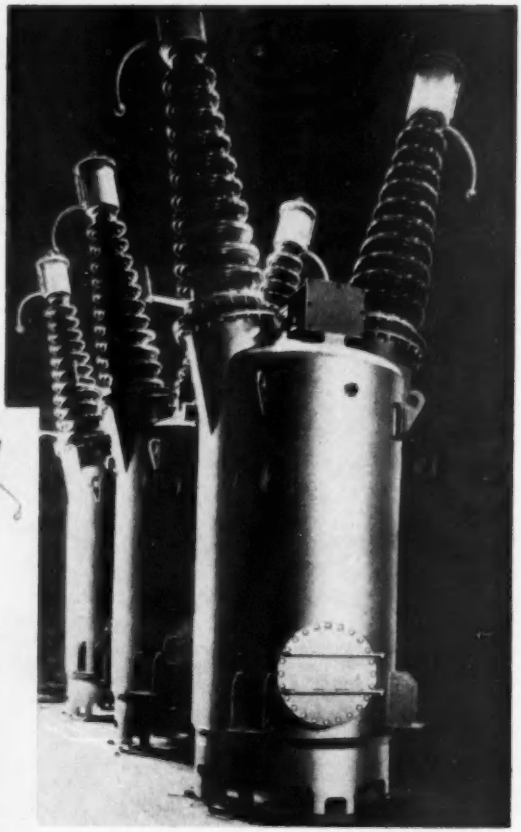

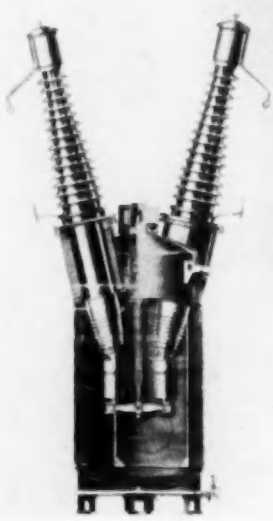

Sectional drawing through a single-pole unit showing resistor-shunted self-compensated arc-control chambers

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ELECTRICAL TIMES

Vol. 118 No. 3071 THURSDAY, 14 SEPTEMBER, 1950

PUBLISHED EVERY THURSDAY

FIFTY-NINTH YEAR OF PUBLICATION

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THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2
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Editorial

DISQUIET AGAIN

THE SPATE of dissatisfaction that followed immediately on vesting day has to a large extent been lulled by time. But in certain sections of the industry this feeling appears to have grown rather than diminished, and for some time past we have heard disquieting stories of redundancy, removal and uncertainty which are affecting morale amongst technical staffs. Such feelings appear to have found free expression at a meeting this week of the Combined London Sections. The discussion appears specially to have focused round the imposing, on applicants for posts, of conditions of employment contrary to the N.J.B. Agreement. These criticisms, we understand, were levelled particularly at one of the sub-areas of the London Board, and at the South Eastern Division, and the meeting culminated in the passing of a resolution calling for the restraint or removal from office of any officials adopting this practice. While it is unlikely that such a resolution will be endorsed at national level, it is indicative of the intensity of feeling which exists in certain quarters.

BLIND EYE FOR GAS

PREVIOUS reference has been made in these columns to the Herculean efforts which E.D.A. have made to get the Chancellor to see reason over the question of purchase tax on water heaters. In vain has it been pointed out that the supply industry not only wants —but needs—the largely off-peak load which this device could bring, in vain have the ridiculous anomalies between, for example, the 100% tax on the plain immersion heater and the tax-free wash-boiler, been pointed out. The case was, in fact, presented with such cast-iron logic as to leave the Chancellor with no loophole except the last hope of the authoritarian politician—a refusal to discuss the matter farther. No further consideration was to be given to "sectional interests," we were informed. That being so, it was interesting to receive last week a notice that the purchase tax on gas space heaters of a certain type was to be reduced from 100% to 66⅔%. It would appear, therefore, that while a combination of electrical manufacturers and the supply industry is a "sectional" interest, the manufacturer of a particular type of gas appliance is not.

CLEAR THINKING WANTED

THE LOGIC of this step escapes us for the moment—it may be argued, of course, that it is a logical step to bring this particular apparatus into line with other gas appliances. If this is so, it would surely be only logical to introduce some rationalisation into the water heater field. It has been suggested that this deep-rooted phobia against immersion heaters is due to the fear of a peak caused by thousands of such elements, used as auxiliaries to "back-boiler" hot water systems, being switched on to provide morning hot water before the fires are lit. A little thought will show that this theory is untenable—the occupants of the average household have finished with their hot water and gone out to work long before peak load problems commence. If the electrical industry were not fundamentally honest at heart, some enterprising spiv would, ere now, have produced a "throw-away" cardboard wash-boiler to enable immersion heaters to be sold tax free. As it is, the normal reaction will be to fit elements of the industrial type which have a higher loading, thus accentuating the peak problems which the punitive tax is presumably intended to solve.

TELL THEM HOW

WHEN special tools are required for the necessary adjustment of some unit of engineering plant, great care is usually taken by the manufacturers concerned to ensure that they are appropriately designed, and readily available. Judging by the warmth of comment made during the S.I.M.A. Symposium by engineers who described themselves as "users" of industrial instruments, the same cannot always be said of that necessary adjunct of a complicated electronic equipment, the instruction manual. This opinion reinforces the remarks of Professor Kapp at Birmingham only the week before, when he spoke of the low overall standard of the presentation of technical information. Clarity and completeness are the two qualities most required in this branch of engineering literature, and the manufacturer should strive after these characteristics as energetically as he seeks to ensure the mechanical excellence of his product. Manufacturers will do well to take notice of this widespread consumer complaint, and to recognise that instruction manual production is not an undertaking to be regarded as a sideline rush job. Increase in goodwill is the reward awaiting the necessary effort and this is especially likely in the case of overseas customers for whom correspondence with manufacturers entails considerable delay.

NO WAITING

ENGINEERS engaged in experiments like to know the result of any test quickly, and if that result turns out to be important they want a record of it to keep. With the oscillograph becoming to an increasing degree the measuring instrument in research, satisfaction of the second requirement means that the first has to be abandoned, because of the necessity for photographic development. Like most engineers, we have suffered impatiently while the film of a crucial test record was being processed, and it is the memory of such occasions that makes us enthusiastic about a Ferranti development shown at the S.I.M.A. Symposium exhibition last week. By cleverly avoiding moving parts in the indicating section it gives a permanent record of wave forms accurate up to a frequency fully sufficient for most power engineering work—and it delivers that record into one's hand as the test is carried out. Development work on this instrument is still proceeding, but there is no doubt that when it is available it will prove a most welcome addition to many laboratories and test departments.

Meteor

THIS WEEK'S PHOTO

BATTERSEA "A" and "B" generating stations, which were built by the former London Power Co. and are now operated by the London division of the British Electricity Authority, occupy a 15-acre site on the south bank of the Thames. First supplies were given from Battersea "A" in 1933, the initial plant installation comprising six 250 k lbs/hr Babcock and Wilcox boilers, generating steam at 625 lbs/sq in. and 862° F, and two 69,000 kW 3-cylinder turbo alternators manufactured jointly by the British Thomson-Houston Co. and Metropolitan-Vickers. Two years later, the "A" station was completed by the commissioning of three 300 k lbs/hr Babcock and Wilcox boilers, and a 105,000 kW 3-cylinder Metropolitan-Vickers turbo-alternator, which is the largest set operating in Europe.

The "B" station boiler plant at present in operation comprises two Babcock and Wilcox boilers rated at 400 k lbs/hr, steam conditions being 1,420 lbs/sq in. and 965° F. The first section of "B" turbine hall contains a cross-compound Metropolitan-Vickers' set, the 16,000 kW primary unit of which exhausts to a two-cylinder 84,000 kW secondary unit. Supplies from Battersea "B" were first given in 1944. All boiler plant so far commissioned is stoker fired (with a small p.f. boost in some cases). The six 425 k lbs/hr Babcock and Wilcox units at present under construction are fired by pulverised fuel. The second turbo-alternator in "B" station is a 60,000 kW single shaft machine with hydrogen-cooled alternator which, together with a separately driven house set, is at an advanced stage of construction. The third unit will be a 100,000 kW cross-compound set.

The flue gas treatment process in both stations involves the scrubbing of the gases with water and alkaline solutions during their passage through chambers fitted with scrubbers.

A district heating scheme for the City of Westminster's Pimlico Housing Estate and the adjacent Dolphin Square flats will be commissioned shortly. Two 1,350 kW back pressure sets, with the necessary heat exchangers and circulating pumps, have been installed in the station.

In the sixteen completed years of its existence, Battersea has, in the matter of thermal efficiency, been placed first on ten occasions and second on four. For 1949 Battersea "B" alone achieved a thermal efficiency of 28·81% based on units s/o.

ELECTRICAL TIMES POWER STATION SERIES.
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CIRCUIT-BREAKERS FOR 300 kV

—*Some Problems Associated with their Design*

by A. H. POLLARD,* B.Sc., A.M.I.E.E.

Part 1. General Considerations

Growth of Systems

THE necessity for super-position of a higher voltage transmission or network on to existing systems is becoming a pressing problem in many countries desirous of developing their industrial potential.

Where the distances are great, a superimposed higher voltage will permit large blocks of power to be transmitted over long distances. Where the distances are comparatively short, but the load density is high, as in Great Britain, this higher voltage will permit a considerable increase of the generating capacity without necessarily an increase in short circuit currents on the existing networks.

The technique of allowing systems to grow (by the super-position of a higher voltage network of greater breaking capacity) and avoiding a rise in the available short circuit current in the existing networks by splitting them into sections is well established. The only inter-connection between sections is thus through the higher voltage network, and the step-up and step-down transformers provide reactance to shield the existing network from the high short circuit MVA at the higher voltage levels.

However, as the process continues, the recovery voltage after short circuit continually approaches the limit of 100% of the service voltage, and the RRRV continually approaches the natural values obtained under test plant conditions (that is where the test plant has no added capacity to reduce the frequency or added resistance to reduce the peak of the restriking voltage).

Before advantage can be taken of a superimposed system it is necessary to develop the high voltage breakers to protect the system. The circuit rating of the superimposed system is usually large, and the breaking capacity rating of breakers will also be large as limitation by the introduction of added reactance tends to reduce the stability under short circuit conditions. To maintain system stability and reliability of operation, breakers must incorporate all the advances which have been made up to the present, and in this article the more important requirements of breakers are given and the methods adopted to satisfy these considerations.

* Deputy Superintendent Engineer, BTH Willesden.

Serviceable Life

A circuit-breaker can become unsuitable for duty at its location, either because the fault current increases until it exceeds the breaking capacity of the breaker, or alternatively because it is not able successfully to deal with the increased RRRV.

With the growth of generating capacity and the super-position of the higher voltage transmission, the sections can be so arranged that the short circuit current remains constant, but the recovery voltage and RRRV will continually rise and approach the values obtained under test plant conditions. Unless a breaker, when installed, is virtually insensitive to RRRV, its performance may become unsuitable (in, say, 10 or 20 years) owing to its inability to deal with the increased RRRV, even though the fault current is not increased.

As is well known, modern oil circuit-breakers, with resistance switching, are virtually insensitive to RRRV; therefore there is no reason why the oil circuit-breaker described in this article should become unsuitable due to this cause.[1]

An airblast resistance switched breaker with a linear resistor of low ohmic value, giving logarithmic damping of the restriking transient, is also insensitive to RRRV.[2] In this article, however, it is not proposed to deal with this type of breaker.

Fault Clearance

Where the load is great, consideration must be given to system stability if the maximum output of stations is to be always available.

Upon the occurrence of a fault, the mechanical input to the machines remains constant, and the rotors will accelerate or decelerate according to changes in kW demand, resulting in relative phase displacement.

If the rotor displacements become too great during the short circuit, they will continue to increase after fault clearance and the machines will fall out of step.

The displacements are affected by both the magnitude and the duration of the fault; thus, for a given fault, the limit of system loading is set by the fault clearance time, i.e. the time for the protective gear to operate plus the breaker "total break time." "Total break time" is the time interval between the breaker receiving the trip impulse and the extinction of the fault current arc, which, for the reasons given above, must be as short as possible.

Auto-Reclosing

The majority of faults are transitory and, when stability is important, a circuit should remain disconnected for the minimum time that is required for the fault path to recover sufficient dielectric strength to withstand the re-application of voltage.

When the duration of the fault is long, even when the current is relatively small, large volumes of luminous gas are formed, in the form of a large billowing mass, requiring a comparatively long time to cool, and dispersing slowly. The possibility of the fault spreading to other phases is thus considerably increased.

Since, with a non-resistance-switched breaker it is generally found that the total break time for the low values of short circuit current is materially greater than that for the high values of short circuit current, the dead time during instantaneous auto-reclosing duty may have to be determined by the total break time required for the clearance of low MVA faults.

The total break time for resistance-switched breakers is substantially the same for the interruption of all fault currents, within the breaker rating, and the reclosing time need not therefore be increased for the low values of fault MVA.

During instantaneous auto-reclosing any capacity charge (the magnitude of which is proportional to the square of the voltage) trapped on the line will discharge through the fault path, so maintaining the hot column of gas during the discharge period. Consequently the actual time to reach zero current through the fault path, after the interruption of the main arc at the breaker, will be governed by the magnitude of the charge on the line.

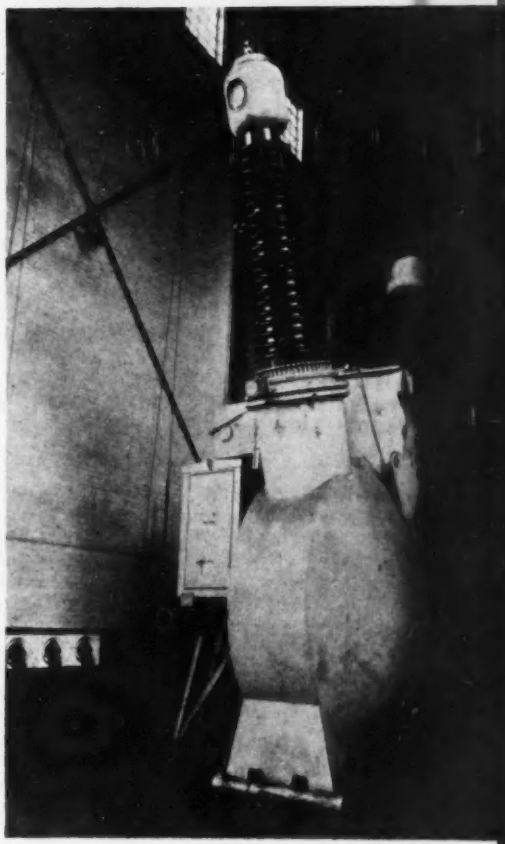
With non-resistance-switched breakers at the instant of clearance the power factor of the fault will be low and approximate to zero. the voltage will then approximate to its maximum and the charge trapped will also be a maximum.

In general, with this type of breaker, the circuit will be re-made when the voltage across its contacts is a maximum, and this corresponds to a sudden application of the peak value of the system frequency voltage. Should the remote end of the line be open circuited the travelling wave will be reflected with doubling magnitude at this location.

With resistance-switched breakers the power factor of the resistance current on interruption will be high and therefore the voltage and charge on the line will be very much reduced. Further, on remaking the circuit the voltage is applied through the resistor and consequently there is a material reduction in the magnitude of the travelling voltage wave.

Taking these factors into consideration it

The B.T.H. type JW416 circuit-breaker in test bay



may well be that the reclosing time for a resistance-switched breaker can be less than for a non-resistance-switched breaker.[3]

Normal Switching Conditions

Though circuit-breakers are designed primarily to interrupt heavy fault currents in emergency, it is also important to ensure that normal switching operations do not initiate conditions which, unless limited by some other means, may cause either electrical or mechanical breakdown. Dangerous switching surges are usually caused by the interruption of either capacity currents or small inductive currents.

Switching Capacitive Currents

If during interruption of line charging currents, by a non-resistance-switched breaker, a delayed restrike occurs, very high mechanical stresses can be set up in the interruptor by the extremely fast generation of gas due to the rapid discharge of the electrostatic energy of the system through the interruptor. Also due to the sudden collapse of the voltage, very high interturn and intercoil voltage stresses can occur in associated transformers, reactors, etc.

By fitting resistance-switching to breakers and using resistors of a few hundred to a few thousand ohms, the possibility of a restrike is reduced, and even if it occurs the effects are innocuous owing to the lower voltage at which the restrike takes place.

Further, when energising the capacitance load the resistor is inserted first and then short-circuited by the main contacts. The insertion of the resistance reduces the voltage oscillations and current surges which are normally produced when connecting the lines to the bus. This connection usually occurs when the voltage is at its maximum.

Switching Small Inductive Currents

When interrupting small inductive currents with a non-resistance-switched breaker, if pre-zero arc suppression takes place, the prospective value of the voltage is the suppressed current in amps multiplied by the surge impedance of the circuit, superimposed on any 50-cycle component which may be present.

During the interruption of the main arc by a resistance-switched breaker, over the range of current where pre-zero arc suppression can take place, the resistance logarithmically damps the over-voltage transient; since the resistance improves the power factor of the circuit during the interruption of the resistor current, the restriking transient is much less on final clearance.

A further advantage is obtained when switching-in a transformer, since the resistance is first inserted in the circuit. Thus the values of the switching surges are reduced to innocuous amounts.

Testing

The testing of large circuit-breakers at the higher voltages presents difficulties, as the existing test plants are not adequate to carry out three-phase tests on three-phase breakers at 100% current and 100% recovery voltage at the same time.

The importance of the duty on these larger breakers accentuates the necessity that there should be no uncertainty regarding their ability successfully to interrupt all currents within their rating. Consequently, means must be adopted to increase the effective scope of the test plants.

In the past, on oil circuit-breakers, it has been usual to carry out tests at the higher values of short circuit current at reduced recovery voltage, and the justification put forward for this practice, is that when an oil circuit-breaker is tested at 100% of its breaking capacity rating it is, over a considerable range, and to a large extent, insensitive to the value of recovery voltage. Moreover, it has been argued that the heavier short circuits on systems have usually been associated with a considerable decrement of recovery voltage.

In future the following two factors may have a modifying influence on this practice:

(*a*) The breaking capacity of breakers is now so high that the maximum test plant recovery voltage during three-phase tests on a three-phase breaker is so low that reasonable doubts may be entertained as to the validity of the test results.

(*b*) Owing to the immense growth of systems the short circuit current has become less limited by generator reactance and more by transformer and line reactance, so giving higher system recovery voltage.

B.S.116-1937 recommends that the recovery voltage for all test duties be as near as possible 100%.

One method of meeting the B.S. recommendation is to manufacture breakers with series breaks and to divide the recovery voltage in a known and positive manner. This will permit each break to be unit tested to a higher value of recovery voltage than would otherwise be possible.

(*A further instalment of this article deals with the actual breaker design.*)

Our readers' views . . .

More Maintenance Handicaps

IN reply to the article, "More Maintenance Handicaps" of your issue of August 31, 1950, there is a further point to which I should like to draw Mr. Atkinson's attention.

When will our motor manufacturers put on the name-plate the details of the ball and roller bearings? I should like some of these people concerned to tackle a serious breakdown due to bearing trouble, and have to dismantle their motors to get the precise details of replacements, or ring up the motor manufacturers for these.

Perhaps some of these manufacturers would suggest an alternative short cut to save industry some of this sheer waste of valuable time.

A. L.

MACCLESFIELD.

WHILE I enjoyed the article "More Maintenance Handicaps" in your issue of August 31, I cannot agree with all Mr. Atkinson's ideas.

Non-interchangeable end shields for motors sound all right, but from the manufacturers' point of view it means extra expense in jigs, tools and the inevitable extra cost of making half the quantity of two different pieces. The same applies with even greater force to his suggestion regarding ball races. What we maintenance men want is a reduction in the number of different ball races, not a deliberate increase. Experience overseas with machines having different races showed that one could never keep proper stocks of both types. One always had a surplus of one type and ran short of the other—and it was not always the driving end which failed. In any case, are we maintenance men assumed to be mentally defective that we need pap-feeding to this extent?

"Wirebuster"

OXSHOTT

◆ ◆ ◆

Price-Cutting Again

THOUGH I have heard wild rumours of price-cutting, to which Meteor makes reference, I question whether the evil is so prevalent as suggested. When these rumours reach me I always make an effort to obtain evidence and take what steps are possible to bring the offender to book, but to date no evidence has been forthcoming.

No wholesaler operating a proper electrical wholesale business can indulge in price-cutting without impairing the service he offers or taking steps to the Bankruptcy Court. The margin available for the electrical wholesaler today, at a time when he has to supply units of the British Electricity Authority at uneconomic rates, make price-cutting even more dangerous.

The "brass-plate" merchant will always be guilty of price-cutting, in fact it is his method of earning a living, and for that reason it should be the concern of all reputable manufacturers to prevent their products getting into the hands of such firms.

Unfortunately, when a recession in trade occurs, and supply exceeds demand, many manufacturers appear to think that by increasing the number of wholesale outlets they will obtain increased business. All wholesalers know that it does not work that way, but that it can be the means of creating price-cutting, because the newcomer is anxious to prove to the manufacturer that he can dispose of his goods.

In conclusion, I would ask Meteor why he uses the word "middleman," a word which politicians and others have made to carry a stigma. It is a word never used in the electrical wholesale industry, neither by the manufacturers, nor by retailers who work closely with us.

To the public in general, "middleman" means a parasite who is anxious to obtain a reward for doing nothing. In certain trades, where there are two or three sources of distribution between the manufacturer and the retailer, the word "middleman" has a very unsavoury meaning, and is often fully justified.

A. B. Wildsmith
Director

THE ELECTRICAL WHOLESALERS' FEDERATION.

(We can only state that the information on which "Meteor" based his note came from a reliable source. There is no suggestion that it is as yet widespread, the point at issue is that when irresponsible individuals cut prices, there is a temptation for reputable traders to follow suit and the note was intended as a timely reminder that this can only bring disaster all round. "Middlemen" was used purely to save undue repetition of the word "wholesaler"; if any invidious distinction was attached to it, we apologise. —ED.)

British Plant for South Africa

Further Orders placed by Escom

IMMEDIATELY prior to his return to Capetown in the *Capetown Castle* last Thursday, Mr. A. M. Jacobs, chairman of the Electricity Supply Commission of South Africa, held a conference at which he expanded on the news, earlier reported, that the Commission is to spend £54,000,000 on its development programme covering the period up to 1955.

He explained that it had been necessary to push on with such a vast programme, for, during the war years, very little new generating plant was installed. This was partly due to the rather "isolated" position of South Africa at that time, with heavy demands on shipping and the need to avoid any undue risk. In fact, while in England in June, 1939, he placed orders for turbo-alternators and boiler plant intended for the 1941 extensions at Durban, but that equipment was turned over to Britain and is now operating at a power station near Reading. As a result the Durban extension did not get off the mark till 1945.

Gold Mining Demand

During the war years, the demand for power increased steadily and it was not until the end of hostilities that it was possible to make up a definite plant programme. Then, in September, 1949, came devaluation, which had a marked effect on the Union's gold mining industry. This industry had expanded so rapidly that in June last, a maximum demand of 1,000 MW was reached on the Reef, in the Transvaal. This territory would eventually be served by the Vierfontein station, for which five 30 MW turbo-generators and nine 210 k/hr boilers were on order. It was planned to have this station in operation by the end of 1952, followed a little later by the Taaibos station. (Reference to the other stations involved in the development programme, was made on page 260 of our August, 17, 1950 issue.)

Explaining that the £54,000,000 covered all the necessary works and equipment, Mr. Jacobs estimated that after allowing for all local expenditure on site work, and other charges, about 50% to 60% of the total amount would be spent in the United Kingdom. This covered turbines, boilers, piping, h.t. and l.t. switchgear, line insulators and s.c. aluminium wire for the 132 kV powerlines.

Asked if local firms were able to meet the Commission's requirements in regard to insulated cables, he replied that as far as he was aware, no firm in South Africa was yet able to supply 33kV cable, the local products mainly going up to a maximum of 11 kV.

Plant for Westbank No. 2

An order for two 15,000 kW, 3,000 r.p.m., turbo-generators, complete with condensers, feed heaters, and evaporators for the Westbank No. 2 power station of the Commission, has been placed with the Metropolitan-Vickers Electrical Co. Ltd. Situated on the Buffalo River at East London, this new station will adjoin the existing Westbank No. 1 station for which the company has already on order a triple-effect central evaporating plant

Designed for initial steam conditions of 400 p.s.i.g., 800° F, the turbines are of single-cylinder construction; each contains a two-row velocity-compounded stage followed by 17 single-impulse stages and a duplex multi-exhaust stage. Central-flow condensers, each of 17,500 sq. ft surface, provide a vacuum of 28·7 in. Hg at the economic rating of 12,000 kW. The bled-steam feed-heating system for each machine comprises ejector heaters, a drain cooler, one low-pressure and two high-pressure feed heaters; final feed temperatures will be 280° F and 293° F at the economic and maximum continuous ratings respectively. The generators are wound for 3-phase generation at 11 kV and are air-cooled with closed-circuit ventilation systems. Exciters are direct coupled.

LORD CITRINE AT THE T.U.C.

CONSISTENT with giving to the public an economical and efficient service extended to cover the vast volume of consumers, one of the main objectives of nationalisation was to produce happy employees in those industries, stated Lord Citrine, chairman of the B.E.A., in his address to delegates at the Trades Union Congress at Brighton last Thursday. He considered that kind of an objective was infinitely nearer realisation in nationalised industry than it could be in private industry.

Earlier, in briefly referring to the formulation of the basic principles on which nationalisation legislation rested, he pointed out that no two of the Boards were exactly the same in structure; flexibility of mind had been displayed in endeavouring to adapt the organisation of the separate industries to the needs of the public. In his opinion, it would be misguided if an attempt was made to secure substantial alteration by legislation in the policy which had been determined. It was one thing to introduce legislation seeking an alteration, but it was another to ensure that the legislation would, in fact, emerge in the way in which its sponsors desired.

After referring to the task involved in merging all the undertakings taken over, and emphasising the task involved in building up the generating capacity, he turned to the subject of labour relations. Complaints had been made about the slowness of national negotiating machinery, but that, he suggested, was almost inseparable from national agreements. He thought there had been far too many strikes in nationalised industry, though the proportion was considerably less than it was in pre-vesting date days.

Symposium on ELECTRONICS

LONDON, SEPTEMBER 5—8, 1950

Yearly S.I.M.A. Conference and Exhibition grows in importance

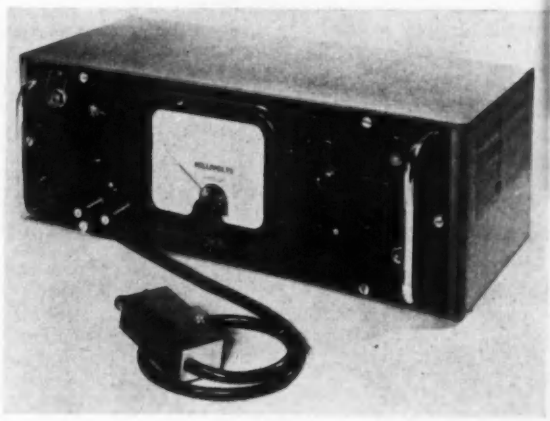
ONCE again this year, the Electronics Group of the Scientific Instrument Manufacturers Association were able to attract a distinguished official of the Government Scientific Service to perform the opening ceremony of their annual symposium, and to persuade a leading academic scientist to deliver the first lecture. As Mr. H. Taylor, the chairman at the opening session on September 5, pointed out, this achievement is in itself a measure of the way the importance of the symposium has become more obvious in its three years of organisation.

Sir Ben Lockspeiser, F.R.S. (Secretary of D.S.I.R.), in opening the symposium, also paid tribute to its importance. The subject of the meetings, he noted, was electronic instruments "in research and industry." Both fields presented their problems, but they were very different in character. There was a heartening collaboration between scientists and the firms that made the instruments they used, but the story of industry was somewhat different. There were some industries, such as the chemical and refinery concerns, in which a high degree of instrumentation existed, but these were in a minority. In general there was not the same demand on the instrument maker from industry as there was from the research worker. The story in the United States was strikingly different.

Turning to recent achievements in the field of electronic instruments, Sir Ben commented on an electronic camera, incorporating an image convertor tube, which recorded detail occurring in 10^{-8} or 10^{-9} seconds. This was a striking application of using the lack of inertia that characterises the electron beam. Within the D.S.I.R. itself the major undertaking was the N.P.L. electronic computing machine. The assembly of a pilot model with a storage capacity of 8,000 binary digits was nearly completed. Fully automatic in operation, the machine would be able to raise a ten-figure decimal number to its 500th power in about the time taken to say "multiply."

Another N.P.L. activity was the formation of a small advisory group to visit firms and assist in instrumentation problems. Formed two years ago, the group has performed very useful work, including the design of some prototype instruments, and is now established as an integral part of Government scientific work. The ideas and the help of research associations were of great value to this group, though it had to be remembered that there were many problems of instrumentation that could be solved without recourse to electronic techniques.

Finally, Sir Ben emphasised the importance attached to collaboration and discussion at all stages between those concerned with the conception, manufacture and use of instruments, if the best results were to be obtained from them.



The Airmec Laboratories Type 784 millivoltmeter was amongst the instruments exhibited

Electron Diffraction

Electron diffraction was the subject of Professor G. I. Finch, F.R.S. (Imperial College), in his opening lecture at the symposium, the title of his paper being "Some Industrial Applications of Electron Optics." The investigations which had been carried out on the

subject had arisen from a desire to reconcile the wave and particle theories of energy and matter, and it was somewhat surprising to find that such a theoretical study had resulted in so much that was of practical interest and importance.

X-rays have for many years been used in the study of physical structure, but they penetrate deeply into the material examined and give no information on its surface properties. The electron diffraction pattern, however, is almost entirely formed by the surface layers of the material examined, depths of from 10 to 1,000 Angström being involved. The depths examined by X-rays and by electron diffraction do not, incidentally, overlap, so there is still an unexplored region.

This surface structure is quite different from that of the general mass of the material, and has an important effect on the physical and chemical properties of the substance concerned. Electron diffraction allows the determination of crystal structure, orientation and average size, and gives information on the "habits" of the crystals concerned. A field where such knowledge is of importance is that of electroplating, which until a few years ago was entirely empirical process. Bath conditions and work routines leading to hard, firmly fixed deposits were determined entirely by experience and lengthy experiment. Now we know that the crystalline nature of the deposit is closely related to that of the substrate crystals. If transition is not gradual, the deposit will flake off, and the same will happen if deposition occurs in such a way as to produce densely packed atom rows normal to the substrate surface. Electron diffraction examination has led to advice being given on the build-up of chromium on worn parts, liners in i.c. engines, and plug gauges.

Oscilloscope Type 1684D by Furzehill

Lubrication

Lubrication is another engineering matter in which diffraction studies have been most helpful. For many years it was thought that the ability of surfaces to slide over one another was due to their being kept apart by a film of oil, in which shearing could readily take place. Electron diffraction has shown that it is sometimes not so much the oil as a thin oxide film on the metal surface which is the key to the process.

When sliding takes place surfaces meet at high spots, with resultant melting of the metal. The molten metal is then pushed over the surface and congeals in any hollows very rapidly, so that there is no time for it to crystallise. In this way a very smooth surface of amorphous—and therefore very hard—metal is formed, which provides a good support for the tough oxide film.

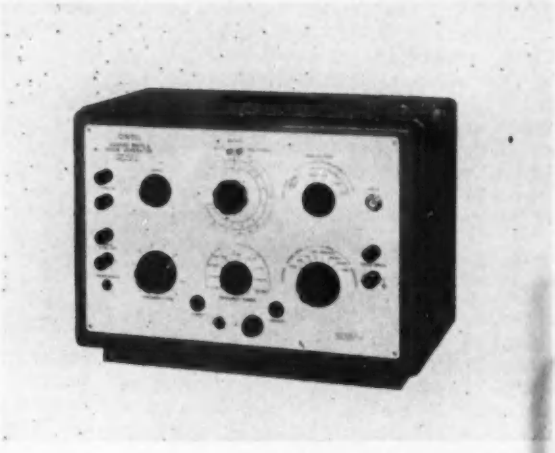
As is known, if two metals are thoroughly cleaned and then pressed together, cold welding results. This happens when the oxide film is torn away due, for instance, to the yielding of the supporting metal. If the surfaces have been run in carefully the amorphous metal layer will break; otherwise the metal will fracture deeper down, and scoring will result. It is the desire for good bearing surfaces to be formed that makes some directions of machining better than others, because of the resultant tool marks.

Concluding, Professor Finch described how electron diffraction could identify adventitious impurities in, say, wireless valves, and the ways in which it could be used as a complement to electron microscopy, the first showing the regular features of the specimen under examination and the latter the "general geography."

Recording Instruments

Wednesday morning's session was devoted to recent improvements in direct recorders. It was opened by Mr. W. Bamford, B.Sc., M.I.E.E. (Everett, Edgcumbe and Co. Ltd.), who surveyed the whole field, and he was followed by speakers who dealt with specific instruments.

Mr. Bamford began by stating his preference for the term "graphic instrument" or "grapher" to "recording instruments." Improvements in such instruments were mainly in the way of greater sensitivity or greater speed—"speed" here involving the time taken to reach full-scale deflection with negligible overswing. The electrical movements used to drive marking devices have improved enormously as a result of advances in magnetic materials, suspensions



This is a square wave and pulse generator CT1, which was shown by Cinema-Television Ltd.

and nickel-iron alloys. Another development is the use of the electronic amplifier either as a direct amplifier or as part of a servo system.

In general there are four components to be considered in a grapher. These are the *operating element*, which drives the *marking device*, which in turn acts on a *recording element*, which has its own *driving element*.

The modern driving element needs high speed of response and minimum inertia. Frictional losses must be kept at a minimum, and it has to be noted that, being a constant error, they become particularly serious as deflection is reduced. When both high speed and high sensitivity are required there are obvious mechanical difficulties, since it is not always possible to increase the burden on the circuit. Amplifiers are the answer, and there are many forms available. The highest speeds so far obtained by direct recording involve a design having no moving parts on the marker. Other techniques involve feedback to amplifiers, with marking elements coupled to potentiometer contacts, and servo operation from a capacity bridge, which gives full-scale deflection for 25 microamp in the somewhat slow speed of 25 secs.

On marking devices there is little to say, but advances have been made in recording papers. Particularly notable is the instantly available Teledeltos paper which contains a lead salt that changes colour on the passage of a current. It usually operates with a platinum-iridium electrode, and a 500 volt, 3 milliamp current, at half a gram pressure. The paper is somewhat expensive, and gives a black line on a grey background that is not well suited to photography, but it has tremendous advantages for high-speed working. Using this paper, one designer has produced a movement which because of the reduction in friction is able to give a rectilinear record.

Recording paper qualities have improved recently, and a wide range of clock drives are available, one mains-driven type with spring reserve working through a differential so that the escapement is always in operation, a factor of some importance in determining reliability.

Mr. Bamford was followed by Mr. Reason (Taylor, Taylor and Hobson), who described in detail the grapher with rectilinear co-ordinates. Its development had arisen from the need to record wave forms in connection with surface measurements. The stylus is mounted specially, and the paper is curved as it comes to the recording position. Recording is clear cut up to 20 c/s, with less than 2% overshoot, and the sensitivity is 7 mA/in. at 2¼ in. radius. The extra cost of Teledeltos paper is offset because its excellent qualities permit the use of half the width necessary with normal recording papers.

Magnet Improvements

Mr. Townley (Kelvin and Hughes, Ltd.) gave a brief description of his firm's recorder, which had the special feature of taking the suspension strip right through the former, a construction which permitted the use of a very light-weight former. The recorder gives a flat response at constant voltage from 0 to 60 c/s, with a ¾ watt r.m.s. power and 2 watt peak power demand. The maximum practical rate of response is 100 c/s, which involves a writing speed of 1,200 cm/sec. and 800 g acceleration on the pen. He was followed by Mr. Axworthy (Everett, Edgcumbe), who dwelt on the advances in magnet performances which have necessitated complete re-design of many instruments. A particular efficient design was possible by using two magnets, one each side of the moving coil: there was 15 to 20% higher flux in the core for a given magnet volume, and the yoke iron volumes were reduced. The flux density was 5,000 gauss. Still stronger types of permanent magnet are expected to be available shortly.

Mr. Klepp (Elliott Bros.) emphasised the high degree of robustness required by industry for all recorders: the instrument was effectively an electric motor and it had to approach the reliability of the machine. He described a design in which the magnet has been placed within the coil, in the position usually occupied by the core. This permitted working at BH max conditions, with a field of 6,000 to 7,000 gauss, and results in a compact instrument.

2 kc/s Direct

Outstanding amongst the direct recorders described is a Ferranti development about which Mr. Stirling spoke. This instrument, which records up to 2 kc/s frequency, overcomes the inertia problem by having no moving parts—just a row of 32 styli pressing on a 35 mm strip of Teledeltos paper. The voltage to be recorded was changed in a modulation to an equivalent frequency in the range 150 to 750 kc/s and fed to the styli, each of which is connected via a frequency sensitive circuit to respond only to a given frequency range. Thus each stylus marks the paper when the voltage is in a certain $^1/_{32}$ portion of the full scale deflection value.

The frequency response is limited first by the writing speed of the paper, since as the speed increases so does the power demand, and secondly by the high paper speeds necessary to spread out the trace at high frequencies. The paper is kept firm by utilising the fact that it has a conducting carbon backing. To ensure that there is no slip over the controlling wheel, this is anodised and then charged, so that an electrostatic attraction exists between the carbon backing of the paper and the wheel metal.

A double wave trace is quite easily obtained with this instrument by using two modulators and amplifiers to feed the single recording head. The apparatus has the advantage of being relatively portable since the only delicate parts are the small rounded ends of the styli.

Three channel oscillograph unit ME36 by Southern Instruments Ltd.

Electronic Counting

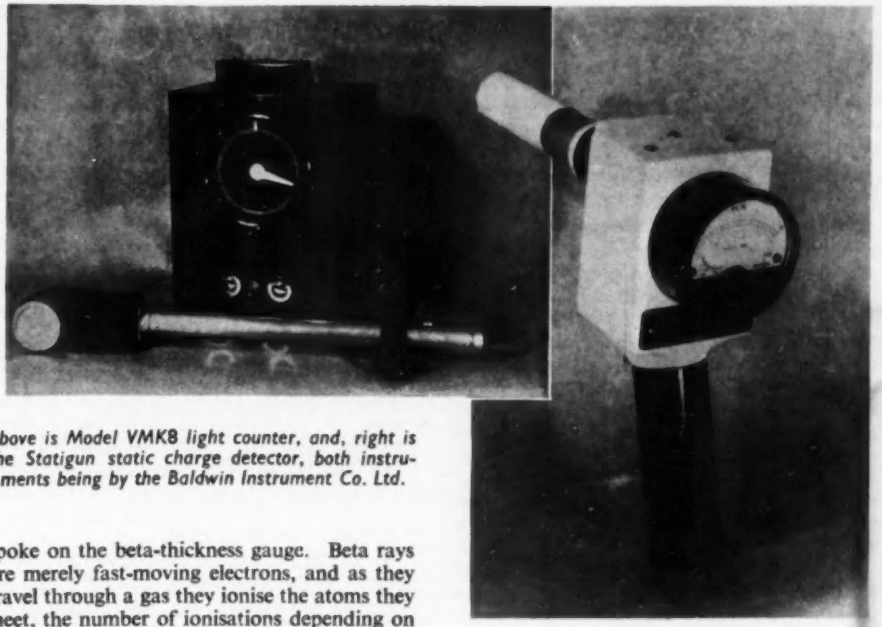
On Wednesday afternoon there were papers on the vibrating reed electrometer and on pH meter design. Then, on Thursday morning, came a contribution by J. McG. Sowerby (Cinema-Television Ltd.) entitled, "Some Aspects of Electronic Counting." The basic principles of scale-of-two counters were developed, and various circuits and pulsing arrangements were described in some detail. Mr. Sowerby then showed how scales other than 2 could be obtained from ring circuits, pointing out that this was a satisfactory and straight method for prime numbers up to 11 and for larger numbers (as scaling factors) which were factorisable into these primes.

To supply other scaling factors, use was made of the principle that a scale of 2^n can be connected to have any values below this. For instance, a series of three pairs of counting valves, giving a scale of 2^3 or 8, can be connected to give a scale of five, by using certain characteristic pulses, such as the change of state of certain valves of the group, to give a forced change of value. A scale of 5 can be associated with a scale of 2 to give a scale of 10, and so on.

Applications of electronic counting are many, the batch counter, however, being notable. Counters can also be applied to frequency indication (counting individual cycles) with the advantage that they cannot slip out of synchronism as can a frequency divider. If a counter is connected to a crystal controlled oscillator it is very convenient for measuring short periods of time, the maximum possible error being 1 digit in the total counted. In frequency measurement it cannot compete with substandard instruments, but it has many advantages over bridge circuits.

Thickness Measurements

The activities of Harwell came to the notice of the symposium on Thursday afternoon, when Mr. G. Syke (Baldwin Instruments Co., Ltd.)



Above is Model VMK8 light counter, and, right is the Statigun static charge detector, both instruments being by the Baldwin Instrument Co. Ltd.

spoke on the beta-thickness gauge. Beta rays are merely fast-moving electrons, and as they travel through a gas they ionise the atoms they meet, the number of ionisations depending on their energy. In air one β particle of average energy will leave 50 to 200 pairs of ions in its track. At each successive ionisation it loses energy.

Radioactive isotopes, such as are prepared artificially in the nuclear pile, emit Beta rays with an initial energy of a few million electron volts. For measuring the thickness of an object it is placed between such a source and an ionisation chamber, and the resulting ionisation rate compared with that occurring when the object is removed.

At present the radio-active sources used are sulphur 35 and thallium 204, while strontium 90 is expected to be available soon. The activity of all these sources decreases with time, not in the energy associated with individual beta particles, but in the number emitted in unit time. The decay is exponential, and the isotopes are characterised by the time taken for activity to fall to half. For thallium 204 this half life is 2·7 years, equivalent to a decay of 0·07% per day. For sulphur, 87 days is the half life and for strontium 90, 25 years.

Although precautions must be taken in the use of these radioactive materials, the health hazard is far less than is sometimes imagined.

The ionisation chamber follows well-known design, the only special need being some protection against the build-up of a coating of oil or other contaminent during industrial use.

Measurement Technique

Ionisation current is fed directly to a simple electronic amplifier, with an input resistance of between 10^9 and 10^{10} ohms. The output is indicated on a meter which gives the thickness of the specimen being measured in terms of per unit weight per unit surface area—i.e. the absorption of the beta rays depends on the material density. Since the ionisation current/thickness curve is logarithmic over its centre portion, it is possible to have another centre zero meter showing percentage deviation from a pre-set thickness, an indication of special value in many industrial processes.

Typical applications are the control of successive rolling operations in aluminium foil production, and the determination of thickness and moisture content (through density changes) in paper manufacture. Where wide strips of material are involved, several source/ionisation chamber pairs may be placed across the width. For measuring the thicknesses of coatings such as carbon on carbon paper, where the coating has to be maintained constant regardless of the paper thickness, two chambers are connected in opposition, one before and one after the coating process, and only the resultant output indicated.

The trend of development is towards extending the range which can be gauged, and

improving the sensitivity, which is at present 0·01 mgm/sq cm. (Many industrial products such as plastics, paper, have a density of about 1 mgm/cu cm.) A second line of development is in methods for measuring coating thicknesses when only one side of the specimen is accessible.

User Problems

Some shortcomings of the industry as seen from the user's viewpoint were put to the manufacturers on Friday morning by Mr. J. K. Brimley (Nobel Division of I.C.I.). He first of all considered plant installation problems, suggesting that instrument makers sometimes took their own clean factories as a standard for "industrial conditions." There is scope for a wider use of resilient mountings and component retaining devices, to combat vibrationary conditions, and manufacturers might well make more use of surfaces for cooling, thus sealing the instrument case so that corrosive atmospheres and water cannot come in contact with the instrument proper.

Turning to the general style of apparatus, Mr. Brimley asked for greater accessibility of components likely to need changing or adjusting (valves and external connections), and for an avoidance, so far as possible, of projecting knobs or indicator lamps. The present trend towards miniaturisation has no attraction in the large industrial plant, where the instrument is very small compared with the apparatus it meters. The only effect that size reduction has is increasing the difficulty of maintenance.

In the list of troubles that affect electronic instruments, complete failure in operation of valves or other components now comes low down. There is much more trouble with plugs, sockets and flex leads, and the use of moulded Perspex for plugs, so that connections can be seen, has much to recommend it. Contact troubles are also of more occurrence than valve failures, some firms still mounting contacts in a horizontal plane, so that they retain dust, etc.

Design for Industry

In designing electrical instruments for industrial use it should be realised that they will seldom be looked after by skilled electronics men. The plant maintenance man will be concerned with many other matters, and all he can be expected to do is to replace a valve or some external connections, or replace a complete unit. To assist in arranging this, it is most desirable that a really comprehensive instruction manual should be issued, including a wiring diagram and fault table, together with a brief account of principles of operation.

With respect to safety, instruments designed for laboratory purposes can be death traps, and the Factory Inspectorate's general concern about dangers special to electronic instruments when used in workshops deserves full attention.

Sometimes a special type instrument is required in small numbers. It is at present cheaper for the user firm to develop and manufacture this rather than contract the problem out to an instrument maker. Possibly closer contact between technical representatives of the manufacturers and the production engineers they service can change this.

Exhibition

Twenty member firms of the Electronics Group of S.I.M.A. were exhibiting a wide range of instruments at the exhibition which was organised in conjunction with the symposium, and a notable feature of the items on show was the many specialised requirements of industry that were served.

On the MULLARD stand, for example, there was an ultrasonic soldering iron, the vibration being obtained from the nickel core of a transducer, and acting to destroy the resistant oxide film on aluminium, magnesium and such-like metals which are not easily soldered. This same firm showed a conductivity controller which deals with the range 0·1 to 100,000 micromho, and facilitates the checking of electrolyte. A Wheatstone bridge network operating at 2·9 kc/s is incorporated.

In the CINTEL display a micro-second counter giving a direct dial reading from 1 microsec up to 10 seconds was of special interest in view of Thursday's paper on the subject. It consists of two crystal controlled oscillators of 1 mc/s and 100 kc/s frequency and six decade counting circuits, and also includes provision for 100 c/s (mains controlled frequency) working to give a total time range from 10 millisec to 10,000 sec. Times are indicated on direct reading dials. A number of special purpose cathode ray tubes were also on view, together with industrial and capacitance bridges.

AIRMEC LABORATORIES attracted attention from power engineers with their ionisation and insulation tester, which facilitates the checking of insulation in a non-destructive manner. They also included in their display a new millivoltmeter (Type 784) suitable for audio and supersonic measurements over the range 30 c/s to 5 mc/s, the range extending up to 1 V.

BALDWIN INSTRUMENTS LTD. illustrated the paper on beta ray thickness measurement

with a display of their products in this field, and they also showed an instrument called the "Statigun" which detects and measures static charges, and is thus very useful in paper and fabric industries. SALFORD ELECTRICAL INSTRUMENTS LTD. also dealt with the requirements of particular instruments by including on their stand moisture-in-timber meters and a magnetic sorting bridge for comparing ferro-magnetic components made under mass production conditions.

Recording difficulties were dealt with by SOUTHERN INSTRUMENTS LTD., who, in addition to oscillographs and a camera, feature and automatic developer for use in conjunction with 70 mm recording paper. Up to 50 ft can be handled, and taking half this length as typical, the overall processing time is 14 mins. Oscilloscopes were also prominent on the stand of FURZEHILL LABORATORIES, special types for strain gauge work being included.

EVERETT EDGCUMBE included timers and contactors in their display, and also gave space for the FERRANTI high speed recorder which was described in one of the symposium papers. ELLIOTT BROS. as usual showed magnetic amplifiers and potentionmeter type recorders, and also made a special feature of a 10 channel strain display equipment. There individual items were backed up by a range of precision electrical measuring instruments.

BAIRD AND TATLOCK featured a recording absorption meter which detects and records small changes in the colour of liquids, while the principal exhibit on the stand of HILGER AND WATTS was a frequency response meter or use with infra-red detectors.

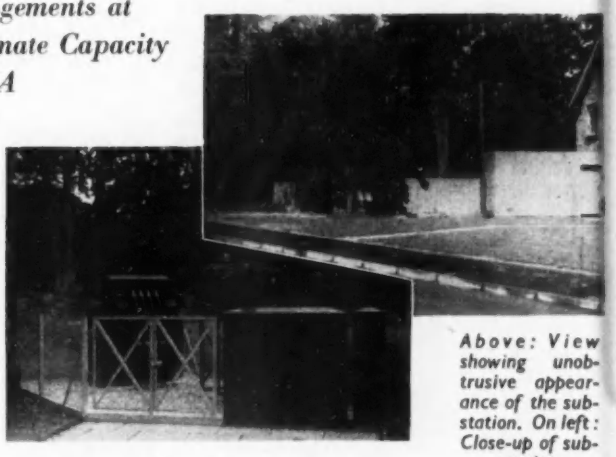
E. K. COLE LTD. showed beta-gamma radiation monitors, thickness gauges and associated equipment, while another firm that had similar apparatus on view was ELECTRONIC INSTRUMENTS LTD. Both these firms also featured vibrating reed electrometers, and the E.I. type having an input impedance greater than $10^{16}\Omega$.

Distribution in the New Towns

SEABoard's Arrangements at Crawley envisage Ultimate Capacity of 60 MVA

FIRST of the substations in Crawley New Town has been commissioned by the South-Eastern Area Board.

Designed to serve a self-contained community of 60,000, the distribution system is planned for three stages of approximately 20 MVA per stage which, it is anticipated, will satisfy the demand from domestic, commercial and industrial users. Each stage will, it is estimated, require some 40 substations of 500 kVA capacity, to feed the low-voltage network.



Above: View showing unobtrusive appearance of the substation. On left: Close-up of substation

Collaboration between the Board and the Development Corporation has resulted in the adoption of a type of outdoor substation which is economical in space and capital cost while, as is seen by the illustrations, it is of unobtrusive appearance. The site occupies 144 sq ft, the h.t. switchgear and transformer being enclosed within the fence while the l.v. distribution pillar and street lighting control gear is mounted flush with the fence and accessible without entering the enclosure.

Major reinforcement of the grid at Three Bridges will be necessary in order to supply the Board's bulk supply substation which is being established there.

The design and construction of the distribution system is being carried out by the staff of the Mid-Sussex Sub-Area of the Board.

Problems and Practice

IN ENGINEERING

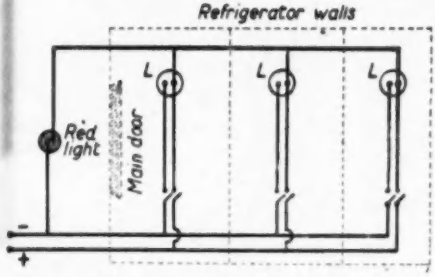
Double Fault

CASES of shock are often due to a combination of two faults, and frequently one of the faults was known beforehand, and permitted to exist due to lack of spares or time. A housewife complained of receiving a severe shock when using an electric iron in a kitchen with a tiled floor.

Inspection revealed a properly earthed installation with three pin switch-sockets and plugs. The insulation of the iron had failed, and showed a dead earth when tested. On various occasions the three pin plug on the iron flex had been dropped and, due to the shape of the plug, the earth pin had taken the full impact. In the design in question the reduced threaded portion of the pin is screwed into the bakelite base, and one impact too many had snapped off the earth pin, which had rolled away unseen. The shuttered switch-socket should have refused admission to the mutilated plug, but at some previous date, a local wireman had "repaired" the broken bakelite shutter by the simple method of removing it.—*F. R. Smedley.*

Refrigeration Afloat

ON board an oil tanker at sea, the captain complained that some of the crew were forgetting to switch off the lights in the refrigerator, which was divided into three compartments, with lights in each and controlled by independent switches, housed inside the refrigerator. The heat expended by the lights was reducing the efficiency of the freezing process, so I had to do something about it.



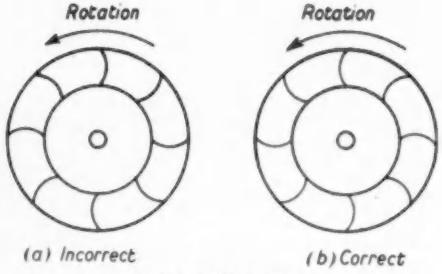
Wiring of lamps in refrigeration compartments

The ship being a very old one, had nothing in the spares department that would suit the purpose, so I decided to make the best use of the existing circuit. I found a spare well-glass fitting and made it into an indicating light by giving the glass a coat of red paint. Might I add that this light would serve a double purpose in the event of anyone being locked inside. I mounted the red light above the outside door of the refrigerator, in a position which would attract the attention of anyone passing by, if it happened to be burning.

The switches controlling the lights were of the double pole tumbler type, so all that was necessary was a few minor wiring alterations, as the circuit diagram herewith shows.—*W. Adam.*

Reversed Pump Impeller

AFTER taking over charge of a new section, I received a complaint that an electric centrifugal pump of 15,000 g.p.h. capacity was making an unusual noise, and that the delivery rate had gone down. The pump was dismantled for inspection and it was found that the impeller had been rubbing against the casing and was loose on the shaft. At some previous date the pump had been overhauled and the impeller reversed in replacement on the shaft, so that the concave portion of the blades led instead of the convex. This error was responsible for the damage and lowering of the delivery rate. Unfortunately, the impeller and casing were so badly damaged that the pump had to be sent to shops for repairs.—*W. Gatehouse.*



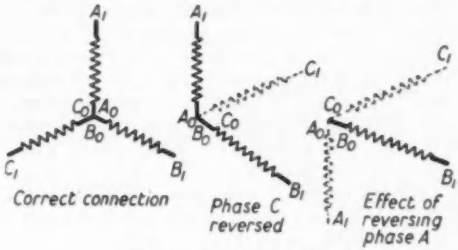
Pump impeller directions

Reversing Connections

A MOTOR at a local factory had been taken down for overhaul and it was reported that after re-assembly its behaviour was not satisfactory. It laboured whilst run-

ning and stalled immediately any load was put on it. The factory electrician had done all that he could but was unable to rectify the fault.

The motor was star connected and the six terminals brought out. The usual tests were applied to the motor and were all satisfactory, so a reversed phase was suspected. The works electrician stated that he had thought of this possibility and had reversed the phases but that this made no difference to the performance of the motor. On further questioning, however, it appeared that he had reversed one phase and, this having made no difference, reversed another. This, of course, was incorrect, as it reproduced the conditions previously existing.



Phase connections adopted

The correct procedure would have been to reverse phase A, and this having no effect, to reverse it back to its original position. Phase B could then be reversed and this procedure continued until the correct connection was arrived at.—*J Pugh.*

Ebonite and its Failings

I HAVE found ebonite compositions such as you find on plugs on electric irons, scarred after being subjected to heat, or a short circuit at the terminals. This scarring must be a carbon substance, as if you couple up the terminals again you will immediately get another short circuit at the same place. In addition I have recently seen a short circuit in the ebonite on a small 440 V 3-phase switch. On this type of switch the thermal overloads were inserted in a shaped ebonite moulding into three shaped boxes. I found a fault on the motor which this switch controlled. The motor fault was a two-phase trouble. After rectifying this, I tested before applying the current and found a complete short circuit between the thermal overloads. These overloads had been heated before the switch tripped, thus causing the ebonite to heat which caused the carbon effect in the ebonite. These faults appear to me that ebonite, after being subject to heat, does become affected with a carbon deposit which will convey electric current. If this occurs with you I advise to scrape and clean the ebonite and shellac well before coupling up the terminals.—*A. Leighton.*

Fault on School Supply

RECENTLY we were called out to a school where the lighting was continuously flickering, and at times completely going out.

The school was built in three sections, the service being run into one and the other two being fed with two 7/·044 v.i.r. cables in 1-in. screwed conduit, the nearest being 85 yd. The two out-lying buildings were metered in the second building.

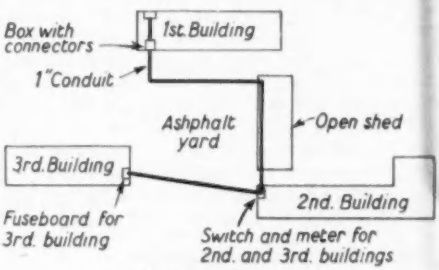
Upon arrival everything was correct and nothing unusual was noted after a check over of all connections from cut-out to main fuseboard.

Two days later the same report came through and this time all lighting was off. A check on all main fuses proved all correct, test lamp across cut-out proved correct, so a lead in the conduit must be the next suspect.

On leaving the service cut-out the conduit passed over a passage, into the boiler house, under the asphalt playground and through an open-sided shed to the meter positions.

As a matter of routine, a Megger test was given, from each end of the conduit, to earth and between, but these readings gave very good readings.

The conduit run was adequately provided with draw-in boxes so we made the nearest to the cut-out the first to come under further tests.



School conduit runs

In this box were two porcelain untaped connectors, but in the phase connector the screw had worked loose and the v.i.r. had been subject to quite a little heat by its appearance.

New mains were run right throughout without soldered or connector joints.

Could any of your readers suggest a method by which the open circuit could be traced down within limits?—*R.S.M.*

Port Washington Performance

An Excellent Record of Availability

by VERNON WALKER A.M.I.E.E.

THE performance of the Port Washington station of the Wisconsin Electric Power Co. for the year 1949 again shows that this station will hold a front place with the latest power stations in the U.S.A.

The station was designed nearly twenty years ago but was not put in service until 1935, due to deferred construction during the early depression years; it incorporated a number of features far in advance of contemporary practice, including the use of a large single boiler per turbine and very low furnace heat release rates. The first boiler of 600,000 lb capacity was designed for 1,330 lb/sq in., 825° F., with an 80,000 kW tandem compound reaction turbine running at 1,800 r.p.m. Reheat to 825° F. was provided half-way through the h.p. section. A second duplicate machine was put in service in October, 1943, except that the superheat and reheat was increased to 850° F. This was followed by a third unit in October, 1948 (see ELECTRICAL TIMES, Jan. 30, 1949). A fourth unit was installed during the early part of last year and put into commission on August 25, 1949.

The turbine in this case was ready about two weeks before the boiler, and primarily tests were carried out by using steam from boiler No. 3 through auxiliary piping, having only 1¼ in. inside diameter. Starting-up steam was reduced by establishing full 29 in. vacuum before accelerating above turning gear speeds, the glands being steam sealed. Despite small steam capacity to operate the turbine, the unit was run 10% overspeed with a reserve margin. Large modern machines require a surprisingly small steam flow to sustain rated speed.

Operational Experience

Thick steel tubes in the heater of the No. 2 unit have caused much trouble due to leakage at the tube sheet joint because rolling and welding had not been tight, and leaks also occurred at points where the condensate velocity was high. Replacement with copper nickel tubes while operating by cutting out each heater by the by-pass has regained high heat transfer and improved efficiency by about 1% without experiencing any leakage.

A day's outage was saved by simultaneously heating with saturated steam groups of four h.p. cylinder bolts, while four adjacent bolts were being prepared for heating. Steam pressure was raised in the bolts during a fifteen-minute period at a calculated controlled rate that raises their temperature uniformly and sufficient to obtain the desired stress upon cooling. Extension measurements and amount of turning of the nuts confirmed correct stressing. This process is being further developed to heat twelve bolts simultaneously, six in a group on each side of the cylinder for both dismantling and tightening.

Table 1 shows the output and performance data for the four units for the year 1949 and from 1935-49.

Table 1. Output and Economy Data

Unit No.	*Period*	*Net Output 106 kW hr.*	*B.Th.U./ kW hr. Net*
1	1949	463.072	11,036
	1935-49	6,248.275	10,852
2	1949	486.479	10,722
	1935-49	3,156.472	10,603
3	1949	562.288	10,087
	1935-49	679.839	10,089
4	1949	184.113	9,939
Plant	1949	1,695.952	10,510

A forced outage time of 0·8% has been averaged by the Port Washington units over the last three years: 0·3% for the boiler and 0·5% for the turbines. Early corrosion trouble on boiler No. 1, and No. 1 turbine blading and generator trouble impair the record of the availability and outage records. The forced outage time average of 0·2% for unit No. 2 during 6·2 years is thought to be an excellent target for all units.

Availability

Availability for the last three years averages 96·2% for the boiler, 96·5% for the turbines and 95·3% for the plant. Operating time for each unit during the last three years is approximately 95%. Turbines 1 and 2 had operated nearly four years (32,000 hours) each before

being dismantled on schedule during the light load period in July, 1949. A moderate amount of silica was found near the atmospheric pressure point (250° F.) notwithstanding that boiler water silica has been maintained throughout the period at the low value of 0·9 p.p.m. Efficiency loss for the last two months before dismantling indicated over 1% loss due to this and the moderate water soluble deposits that occur on long runs, despite about 55 p.p.m. total boiler solids.

Not since 6% of the radiant reheater tubing in No. 1 boiler was replaced in 1946 by welding of new straight lengths during scheduled outage has there been any replacement of superheater or reheater tubing. There has been a few welds made during scheduled outage due to minor shop weld leaks or to small fire cracks on the face of reheater tubes, but otherwise the superheater equipment has been practically without maintenance.

Unit No. 3 has averaged 10,087 B.Th.U. per net kWh during the year, and Unit No. 4 appears to be able to operate within the four-figure region, as it averaged 9,939 B.Th.U. per net kWh during the four months of operation. The increased heat rate of Unit No. 1 reflects lower loads, as this turbine has only two inlet valves. The plant's average heat rate for 1949 is 10,510 B.Th.U. per net kWh. Unit No. 5 is being installed and is scheduled to operate at the end of 1950 or early in 1951.

Television for Scotland

Work Commenced on New Microwave Link

FOLLOWING on the plans made for service to Holme Moss, the contract has been placed and work has commenced on the micro-wave television link which will further extend television to Scotland, to give a two-way television radio-system. This will make it possible for programmes to be fed to the B.B.C. Scottish television station now under construction at Kirk o' Shotts, midway between Edinburgh and Glasgow, and will also give facilities for the relaying of items from Scotland throughout the whole of the B.B.C. television network.

The new radio link, which will be the longest of its kind in Europe, is being designed and installed by Standard Telephones and Cables Limited who, since the first demonstration of a micro-wave link which they gave between Dover and Calais in 1931, have been responsible for many micro-wave developments including some of the portable links at present being used by the B.B.C. Television Service for "outside broadcasts." It will be remembered that a Standard portable micro-wave link was used to span the Channel during the recent television transmissions from Calais.

The radio-relay will follow a route from Manchester northward on the east side of the Pennine Chain to Kirk o' Shotts, an overall distance of 245 miles. The contract includes the provision of seven unattended repeater stations spaced at about 30-mile intervals, to receive, amplify and re-transmit the requisite signals over successive line-of-sight transmission paths. Repeaters will consist of main and reserve receivers and transmitters with four paraboloid aerial assemblies mounted on steel towers ranging in height from 28 to 200 feet.

One of the many special features of the system will be the measures adopted to ensure uninterrupted services. These include reserve transmitters and receivers which will be automatically brought into operation on failure of any corresponding part of the equipment. As an additional safeguard a comprehensive system of supervisory signals and alarms with associated remote-control switchgear will afford a complete picture of operating conditions throughout the system, and the means of switching-in equipment remotely from either of two control stations.

Braiding Machinery Exhibition

AN interesting exhibition of braiding machinery is being held this week by the firm of B. and F. Carter and Co. Ltd. of Bolton, to illustrate to those concerned in the trade the range and capability of the Company's products.

In such a specialised trade as this, there are, naturally, many varieties of machine, ranging from minute machines used for working with wires of gauges in the 36 to 42 s.w.g. region up to large machines used for putting wire braid on hydraulic high-pressure pipes. Most of these are on view, although the largest machines, can only be illustrated by means of photographs.

The "Ace Speedway"

Although the principle of the horngear braiding machine has been well known for many years, the design of the equipment has been subject to continuous improvements. Many people who have visited the stand of Scottish Cables Ltd. at the British Industries Fair have seen this type of machine in operation. The principle is identical with that adopted in braiding the maypole in the old country dances, except that the part of the dancers is taken by a series of rotating bobbins. One of the greatest difficulties has been to maintain an even and continuous tension on the wire or thread fed from the bobbin to the core being braided, and in general this is done by applying a spring-loaded brake to the carrier which carries the "cheese" of thread or wire. However, this does not fully compensate for the variations in tension.

A new carrier, the "Ace Speedway," has recently been produced by Carter's whereby the brake effect is automatically controlled by the thread tension. A new form of fixing, involving the use of rubber rings over the carrier spindle, which are compressed by the annulus in the cheese, enables the spindle size to be reduced. Consequently, a larger cheese may be accommodated on the same machine while considerably increasing the speed of working.

Apart from the braiders, the firm is also showing a flex twinning machine, paper lapping machines, winders, and a selection of their wide range of industrial revolution counters and speed indicators.

ELECTRICIANS IN TRAINING

Details have now been released of an agreement between the National Federated Electrical Association and the Electrical Trades Union governing the conditions of apprenticeship in the electrical contracting industry in England and Wales. Effective as from the beginning of this month, the agreement has the support of the Minister of Works, who is supplying an independent chairman and a secretariat for an Apprenticeship and Training Council which will administer the scheme.

Apprentices will be registered with the Council in one of two classes, either as formally indentured (category I) or as employed under a less formal arrangement giving the same facilities without the safeguard of continuity of service and employment (category II).

Technical Education

Provision is made that there shall be compulsory attendance of the apprentice at a technical course up to the age of 18, either wholly at day classes, up to a maximum of 44 days in any year, or at day and evening classes, with a total attendance of the same effective amount. The employer is required to pay the fees for these classes, and arrange the apprentices' work to facilitate his attendance.

The continuance of education above the age of 18 is to be encouraged, and to this end a "Further Education Fund" is to be established and controlled by the Apprenticeship and Training Council. To finance this fund, which is to be used for making grants when the Council shall think fit, a fee of 10s. is to be levied for the registration of each apprentice.

Both grades of apprentice are to be paid at the same rates, which vary with age from 12% of the basic rate plus 33⅓% of the "addition" payable to a journeyman electrician (at 15 years) to 60% of the basic rate plus 66⅔% of the addition (at 20 years).

The oversight and adjudication of the scheme is to be carried out by the N.J.I.C.

Apprentices indentured before September 1, 1950, may, if all parties agree, be brought under the new apprenticeship scheme and registered accordingly. In all cases supplies of the Model Deed and of other forms to be used in connection with the scheme can be obtained from The Registrar, The Apprenticeship and Training Council for the Electrical Contracting Industry, Ministry of Works, Lambeth Bridge House, Albert Embankment, S.E.1.

overseas news

New Lamp Factory

Construction of Turkey's electric lamp factory at Topkanu is almost completed. It is expected that production will begin before the end of this year. Output of about six million lamps per annum is expected, which, after allowing for local consumption, would leave about two million for export. This factory is a joint enterprise of the American General Electric, the Is Bank and Turkish private concerns.

N.S.W. Water Power Scheme

To augment its present water power and diesel plant, the Bega Valley County Council (N.S.W.) is pushing forward with a new hydro-electric station at George's Creek. At the meeting of the council last month, it was reported that two loan sanctions, totalling £111,000, had been approved. These were intended to cover the cost of the run-of-the-river development. This plant will be used to generate electricity until the dam at George's Creek is completed. Steel ordered from abroad was at Newcastle, it was stated; the Pelton wheels had arrived, and the alternators were promised to schedule within two or three months.

Distribution Conversion

At a cost of £15,150, the distribution system in the Wellington, New South Wales, area is to be changed from 2,300 V to 11,000 V, the work being spread over five years. This decision was reached by the Wellington Muncipal Council, N.S.W., recently, after Mr. F. L. Such, the electrical engineer, had reported that the conversion was necessary for reasons connected with the bulk supply from the Department of Railways, and the necessity to erect additional substations in Wellington.

The Trevallyn Scheme

The first generating sets for the Trevallyn power scheme, Tasmania, should be installed in September, 1953, the acting Prime Minister, Mr. Fadden, announced recently. ASEA are to supply three vertical water wheels. A 75 ft high dam is about to be started to import water which will be carried via a two mile long pipeline through the hillside to the power station with 60,000 h.p. of plant.

Shawinigan Progress

Work on the new Trenche generating station of the Shawinigan Water and Power Co., on the St. Maurice River, is in front of schedule, and it is expected that the station will be operating in January next. Installation of turbines and generators has already begun and the first closure of the dam, which will be carried out in three stages, was scheduled to take place a few days ago. Construction of new transmission lines and the installation of additional transformer and switching equipment at the Trois Rivieres terminal station are also proceeding satisfactorily. By next summer the whole of the station's 325,000 h.p. of plant should be in operation. The company has made plans for further expansion in the future. Four more sites on the upper St. Maurice are now marked for development—one of them between Trenche and La Tuque, and the others above Rapide Blanc. When those are built, and the planned additions are made to four of the present plants, the Shawinigan system's capacity will be increased to more than 2,600,000 h.p.

Price Control

In a Bill moved in the House of Commons by the Minister of Trade, Mr. Howe, last Friday, one clause authorises the Canadian Government to direct the price and distribution of electricity. The Bill empowers the Government to control key materials and services, as a precautionary measure to stop inflation. Mr. Howe said the Bill gives sweeping powers over all materials and services designated as essential by the Cabinet, but he described it as a "standby," expressing the hope that there would be no need to use it if reasonable price levels are maintained.

Station Renamed

The Hydro-Electric Power Commission of Ontario has decided to rename the Queenston-Chippawa plant the Sir Adam Beck generating plant, to mark the 25th anniversary of the death of Sir Adam who, during his 20 years as a great political factor in the province, was a great protagonist of the development of hydro-electric power. The station's capacity is now about 500,000 h.p., but it will be more than doubled when all the water allotted to Canada from the Niagara river, under the recent treaty, is being utilised.

Canadian Import Changes

The Canadian Government has announced that further relaxations in the emergency import controls are to be made with effect from October 1. Some imports which are at present prohibited are to be placed on the unrestricted list from October. These include humidifiers, air-conditioning units for household or office use and dry cell batteries. Other items, including cooking and heating equipment, complete parts of electric vacuum cleaners and domestic washing machines, and electrical equipment of aircraft, which may now be imported under quota, will also be placed

on the unrestricted list. Among the items to be removed from the prohibited list to the quota list are electric lighting fittings (except industrial).

New Factory

An 86-acre site at Scarboro has been purchased by Frigidaire Products of Canada, Ltd., on which is to be built a factory for the manufacture of refrigerators, cookers and other appliances. A single storey factory, 1,080 ft in length will utilise a modern conveyor equipment in the company's new assembly line. It is anticipated that the plant will be ready by September next year.

A Hairy Story

The natural habit of some beavers is threatening the power supplies to the northern Alberta town of Vermilion, which has a population of about 2,000. These beavers have built nearly 50 dams in the Vermilion River up stream from the town's power plant, and now only a mere trickle of water remains in the river where it winds past the generating station, it is reported. The Alberta Lands Department has decided that some of the beaver colonies should be removed to other parts of the province, and that dynamite be used to destroy the dams constructed by the mammals.

Lisbon Underground

The municipal authorities of Lisbon have for some time been pressing for the construction of an underground railway, the "Metropolitano." The tramway company, after consulting technical authorities in England, announced that they considered the Metropolitano plan to be technically possible but financially unsound. In view of this decision, the Company has agreed not to take any part in its construction.

Russian Plan

Another large hydro-electric power station is to be built on the Volga at Stalingrad, it was announced recently. Work will begin next year, and it is planned to put the station into full operation in 1956. It will have a capacity of at least 1,700,000 kW and an annual output of 10,000 million kWh.

Plant for India

Important contracts for generating plant in India's new hydro-electric stations are being obtained by German concerns, it is reported. Four out of five recent orders have gone to German firms, said to have submitted lower tenders and promised speedier delivery dates than American and British competitors. The latest contract, worth about £50,000, covers preliminary equipment for the large Pathri river project in the United Provinces. It was awarded to a Berlin combine. According to the report, the German manufacturers are now making a determined bid, chiefly by price-cutting, to win back the strong hold they had in India before the war.

Plans for N.Z.

The New Zealand Government's plans to overcome the present power shortage, particularly in the North Island, were revealed by Mr. W. S. Goosman, Minister of Works, a few days ago. As far as the North Island was concerned, he said, it was estimated that Maraetai would start operating in 1952, and reach full capacity by 1954, to be followed early in 1955 by the Whakamaru station. The present programme of development was not enough to take care of the situation beyond 1955, and to meet this the Government had decided to aim at having additional hydro-electric stations in operation at Waipapa (55,000 kW) in 1954-55, at Ataimuri (55,000 kW) in 1955-56, and at Ohakuri (93,000 kW) in 1956-57. The Government had decided that construction of the Waipapa station should be undertaken by Departmental and New Zealand forces, while immediate arrangements would be made for the design of the stations at Ataimuri and Ohakuri by overseas consultants. Later, when the designs are ready, tenders will be invited from overseas contractors for the construction of these projects. It was evident that hydro power alone would not be sufficient to meet the island's ultimate electricity needs, but the additional stations now planned would provide a breathing space in which to make a decision on future developments. Summarising the position, he said the Government had decided to press on with investigations into geo-thermal steam plants, and at the same time to investigate the location of normal types of steam plant. But he would not recommend that large-scale fuel-fired stations should be embarked upon until there was a positive decision on the practicability, or otherwise, of geo-thermal steam generation of electric power.

In regard to the South Island, two new machines for Waitaki were on order, scheduled for operation in 1954, while Dunedin city corporation was proceeding with its two new stations at Waipori. Work on Tekepo was making good progress, and this station should be ready next winter. At the Cobb station, shortage of man-power was causing delays, while the Roxburgh station, for which generating plant had recently been ordered, should be ready for the winter of 1956.

Controlling H.P. Terms

Using authority conferred by a newly-signed control bill, the U.S. Federal Reserve Board has put controls on hire-purchase credit terms. The initial limitations—which may be further tightened later if conditions warrant—will become effective on September 18. They require down-payments of at least one-third on cars, 15% on household appliances and 10% on furniture. The Board said it expected the control terms to check overall instalment credit, which had soared above 20,000 million dollars since the Korean war buying wave.

PERSONALITIES IN THE INDUSTRY

An unfortunate accident befell **Mr. S. F. Steward,** C.B.E., M.I.P.E., chairman of the South Western Electricity Board, at Camborne last Saturday, prior to addressing the Electricity Consultative Council. When he was taking some papers from the boot of his car the lid slipped and struck his head. Mr. Steward was taken to hospital, where several stitches were put in his scalp. The injury did not deter him from addressing the afternoon session of the Council, however, and we are glad to hear that the wound is well on the mend.

Our congratulations to **Miss Phyllis Thompson,** press officer of the Electrical Association for Women and sub-editor of *The Electrical Age*, who has just obtained a B.A. (Hons) degree in English at London University. Miss Thompson studied in the evenings at Birkbeck College while carrying on her work at the E.A.W.

For many years associated with the Igranic Electric Co. Ltd., and a director since 1940, **Mr. J. H. Enion** retires from business with effect from next weekend. In 1911 he joined the Adams Manufacturing Company, predecessors of the present company, and has always been mainly associated with the sales side of the business. During the past few years he has also been a director of the holding company, Metal Industries, Ltd., and has been responsible for the electrical interests of this concern also.

General sales manager of the overseas division of Crompton Parkinson Ltd., **Mr. D. E. Graham** has now been co-opted to the board of executive directors for a period of one year from October 1. He originally joined F. and A. Parkinson Ltd., of Guiseley in 1925 as a sales engineer and subsequently represented the company in New Zealand. With the formation of Crompton Parkinson Ltd., in 1927 he went to Malaya, where he was responsible for many installation contracts. Returning to England in 1933 he served for a time in the Manchester branch before going out to India. Later he worked in Birmingham and became branch manager in 1938. He became manager of the overseas division in 1945 and has since travelled extensively abroad.

Mr. D. E. Graham

Mr. J. Diamond, Mr. E. S. Watkins and **Mr. V. B. J. Seely** have resigned from the Board of Scophony Baird. **Lt.-Gen. Sir Charles J. S. King** and **Mr. J. F. C. Dugdale** have joined the reconstructed Board, and Sir Charles has been elected chairman.

Moving from Walsall, **Mr. W. J. Johnson** has been designated resident sales representative to J. A. Crabtree and Co., Ltd., in the Newcastle area. For the past three years he has been engaged as a sales engineer at head office, being responsible for technical correspondence and works liaison in the control gear department. Before going to Crabtree's Lincoln Works, he had gained earlier experience on the heavier side of the industry.

Mr. W. J. Johnson

Recently appointed as engineer in the traction contracts branch of British Insulated Callender's Construction Co. Ltd., is **Mr. G. P. Goodman,** M.I.E.E., who, since 1941, has been with Clough, Smith and Co., for the last five years as area engineer in the Midlands and North of England. Mr. Goodman gained early training with Standard Telephones and Cables Ltd. He joined the electrical department of the Demolition and Construction Co. Ltd., and in 1936 served as assistant resident engineer on the company's tramway and trolley bus conversion contracts for the London Passenger Transport Board.

Mr. J. W. Terry, who has been acting stores superintendent, Southern Region, British Railways, since January last, has now been confirmed in that position.

The State Electricity Commission of Victoria, Australia, has appointed **Mr. N. T. Jewell,** M.E.E., A.M.I.E.(Aust.) as deputy engineer for design and construction. He has had 28 years' service with the Commission, and last year was promoted to electrical engineer in charge of the electrical branch of the design and construction department on the retirement of Mr. E. L. Merigan. The position vacated by Mr. Jewell is filled by **Mr. W. J. Taylor,** who has been in the Commission's service since 1923. He became tests and protection engineer in 1932.

Ekco-Ensign Electric Ltd. have appointed **Mr. N. H. Tuff** as their representative covering the Tees-side area.

Previously with the Midlands Electricity Board, **Mr. H. J. Knight,** ASSOC.I.E.E., has been appointed to the sales staff of Measurement Ltd. He has held various positions on the metering and distribution

side of the industry—before vesting day he was with the Shropshire, Worcestershire and Staffordshire Electric Power Co.

Formerly manager of the Central Gloucester sub-area of the Midland Electricity Board (he resigned at the end of last year to develop a professional career as a chartered accountant), **Mr. G. D. Johnstone,** A.C.A., F.R.ECON.S., M.I.I.A., COMP.I.E.E., has been chosen as prospective Parliamentary candidate by West Bromwich Conservative and Unionist Association.

The Eastern Division of the B.E.A. has appointed **Mr. E. L. Pearce** as station superintendent at Watford generating station in succession to **Mr. W. H. Mason** who has taken up a similar post at Rye House. Mr. Pearce was previously station superintendent at Guildford generating station, South Eastern Division. He commenced his new duties last week.

On Monday last, **Mr. F. H. Schroeder,** D.I.C., B.SC., M.I.MECH.E., M.I.E.E., sales director of Lancashire Dynamo and Crypto Ltd., left by air to visit Turkey, Greece and the Near East. He will visit the company's agents to advise them on the latest L.D.C. products and put into force the necessary arrangements in connection with the expansion of overseas trade. He expects to be away two or three weeks, and will return via European countries.

OBITUARY

We regret to record the death of **Mr. E. A. Hildick,** export manager of the Midland Electric Manufacturing Co. Ltd., as a result of a motoring accident on September 5. He had been with the M.E.M. Co. for 21 years in charge of Export and Transport Departments.

WILLS.—Mr. R. Daw, A.M.I.E.E., late section head (operations and maintenance) Engineering Department, South Eastern Sub-Area, London Electricity Board, left £8,676 gross (£8,059 net value).

Mr. H. Hooper, secretary of the Midlands Division of the B.E.A., left estate "so far as at present can be ascertained" valued at £7,256 gross (£6,652 net value).

NEW LITERATURE

Electric Circuit Theory

by H. Tropper, Dipl.Ing., Ph.D.

HOW much a theorem or a mathematical method is used in practice depends largely on how thoroughly the principles underlying it are understood. In this volume, Dr. Tropper has attempted a review of the fundamental aspects of electric circuit theory, both steady state and transient, and advanced engineering students and engineers should find his work of great value if they have much to do with circuit and network calculations.

The foundation of the book is a thorough discussion of the superposition principle, and most of the work is based on this. Symmetrical component theory and the methods of applying it to fault calculations are described, and then the Heaviside expansion formula approach to transient response is dealt with. This consideration is followed by two more advanced chapters, in which are discussed the physical meaning of the transform concept, with special reference to the Fourier transform, and, arising out of this, the Laplace transform. No knowledge of mathematics beyond elementary differential calculus is assumed. Published by Longmans Green and Co., 164 pages, 8½ in. by 5½ in. Price 15s.

Q. and A. on Electric Arc Welding

by E. Crawford

FOLLOWING the general plan of the Q. and A. series, this useful little book first deals with the general principles of electric arc welding, and then goes on to describe the plant and equipment used. A section on methods is followed by one on technique, and then some specialised types of welding are described. The final sections cover the welding of non-ferrous metals and the mechanical, visual and X-ray examinations of completed welds. Some helpful tables and a list of relevant B.S. specifications are also included in this volume, which should be popular with technicians requiring a compendium of information on the subject. Published by George Newnes, Ltd., 112 pages, 6 in. by 4 in. Price 5s.

BOOKS RECEIVED

Applied Electricity, by E. Hughes. Textbook for Ordinary National Certificate and the appropriate section of the London B.Sc. (Eng.) part I. Published by Longmans, Green, 412 pages, 7¼ in. by 4¾ in. Price 10s. 6d.

Arc Welders' Tables and Data, edited by A. J. Coker. Published by George Newnes, 144 pages, 4¼ in. by 3 in. Price 5s.

Electric Fuses, by H. W. Baxter. Based on E.R.A. researches into fuse performance. Published by Edward Arnold Ltd., 199 pages, 8½ in. by 5½in. Price 21s.

Q. and A. on Radio and Television, edited by E. Molloy. Published by George Newnes, 144 pages, 6¼ in. by 4 in. 4th edition. Price 5s.

Testing Radio Sets, by J. H. Reyner. Fundamental principles of set testing, including a certain amount of design information. Published by Chapman and Hall, 215 pages, 8½ in. by 5½ in., 5th edition. Price 22s. 6d.

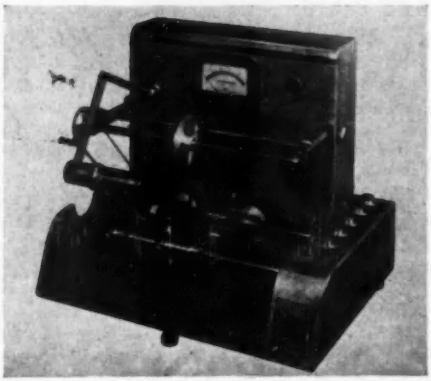
An Introduction to Electronics, by J. Yarwood. Intermediate standard textbook for engineering and physics students who have specialised in other fields. Published by Chapman and Hall, 329 pages, 8½in. by 5½ in. Price 28s.

The BUYER'S *Column*

Rotors No Longer Unbalanced

NEW introduction by DAWE INSTRUMENTS LTD., 130 Uxbridge Road, Hanwell, London W.7, the Type 1250 dynamic balancing machine provides a speedy means of determining the position and the amount of out-of-balance occurring in such rotating bodies as small armatures and rotor units, and shows the amount of correction required.

The great sensitivity of the instrument enables vibrations as small as 0·000028 in. to be detected, and shows by means of a stroboscopic lamp the position at which out-of-balance is situated and



This is the new Dawe dynamic balancing machine

the correction needed. It is ideal for production work, as the operator merely uses two switches enabling complete determina ion in about twenty seconds.

Workpieces from 1 oz to 10 lb can be accommodated. The fine discrimination of the unit is such that one one-hundred-thousandth-of-an-inch R.M.S vibration gives a reading of about 5% full scale on the meter. Corresponding unbalance in inch/ounces is given by the equation (approx.)

$$\frac{\text{Weight of component in ounces}}{40{\cdot}000}$$

The unit operates on a power supply 200/250 V 50 c/s, is arranged for bench mounting and measures 20 by 15 by 18 in. Weight is 60 lb.

Refrigerator Ice Cubes which Work

MARKETED now by the SLOAN ELECTRICAL CO., LTD., 41 Kingsway, London W.C.2, the new "Puck" Flexa cubes seem to be the answer to the hostess's party problems. Made from flexible plastic material these cube formers enable one to make easily removable ice cubes for cold drinks and cocktails. With a Good Housekeeping Institute guarantee, the cubes are sold in two sizes, Standard (FC1) at 3s. 3d. per pkt (6 in number) and Cocktail (FC2) at 4s. 9d. per pkt (12 in number). Wholesale only. Also available from the company is a tray designed for use with the Flexa cubes. It holds one dozen small and half a dozen large cubes and has certain special features. Made of aluminium, it has knife-edge slides thus preventing it freezing to the ice chamber. It enables cubes to be filled from the running tap, surplus water draining away through front slots. Price is 3s. 3d. (inc. tax).

The New Hoover Junior

JUST released are details of the first new post-war Hoover Junior model vacuum cleaner which is available as from September 11. Made by HOOVER LTD., of Perivale, Greenford, Middx., the new junior has many outstanding features. Its quickness in action and ease of handling is very noticeable whilst its self-adjusting nozzle to suit all thicknesses of carpets and the convenient foot switch are points which will find favour with the housewife. This new model No. 119 incorporates the famous Hoover Triple Action, it is priced £15 15s. plus £3 18s. 9d. tax and backed by the Hoover tradition represents remarkable value.

The new Hoover Junior in action

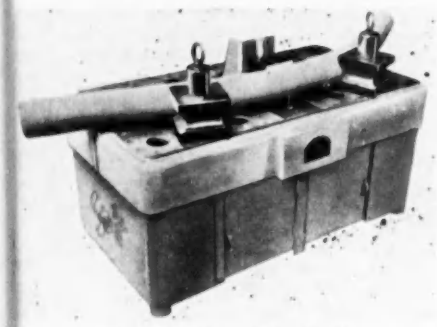
Strong Man Stuff

NEW introduction by CHAMBERLAIN INDUSTRIES LTD., Staffa Works, Staffa Rd., Leyton, E.10, is the "Staffa" 50-ton motorised hydraulic bending machine.

This heavy-duty, general purpose bending machine is of unique design, all electrical, mechanical and hydraulic equipment being housed within the framework of the machine.

The unit is capable of bending steel pipes up to 6 in. bore, cold but loaded, and all types of steel sections up to 8 in. by 6 in. joist. It incorporates a mild steel cylinder operating on a mild steel ram mounted on a strong carriage. Mounted on the base frame of the machine is a patented Beacham high-pressure hydraulic pump driven by a 6 h.p. electric motor for 440 V supply. The control panel is simple, incorporating push-button starter switches and a hand lever for easy control of a three-way hydraulic valve.

Maximum working pressure is 5,000 lb sq in. and length of stroke is 9 in. Maximum and minimum bending pin centres are 28¼ in. and 24¼ in. Overall dimensions of unit are 6 ft long, 3½ ft wide, 2 ft 9 in. high.



This is the 50-ton Staffa bender

T.M.C.-Harwell Introduce New Accessories

IN response to many requests T.M.C.-HARWELL (SALES) LTD., of 37 Upper Berkeley Street, London W.1, have introduced a shuttered 15-amp 3-pin switch socket in a smaller size than their No. 7011 and 7012 patterns. The new switch sockets, List Nos. 7031 and 7032, are approx. 4½ in. by 2⅝ in. wide. They incorporate the Temco 15-amp Q.M. and B. switch action, suitable for a.c. or d.c., mounted on a porcelain base. No. 7031 all-brown switch socket is available at £7 per doz. and No. 7032 all white pattern at £7 16s. per doz. The firm will continue to list the No. 7011 and 7012 switch sockets for the benefit of those who prefer the bigger size, one of the advantages of which is that it makes overhanging the pins impossible without relying on the shutter.

New Ferranti Clip-on Ammeter

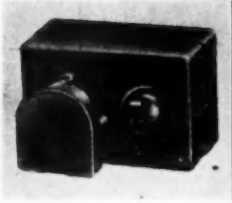
FERRANTI LIMITED, Hollinwood, Lancs., have introduced a new addition to their range of clip-on ammeters. The instrument has been specially designed for use on porcelain-clad fuses which are too large for the normal type of clip-on ammeter and will accommodate fuse and heavy duty conductors up to 4 in. in diameter. Seven ranges of measurement are provided up to a maximum of 1,000 amp. a.c.

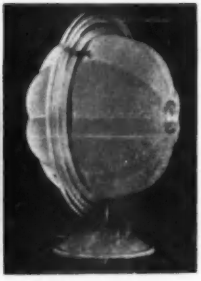
The ammeter consists of a current transformer with a large, fully insulated, centre opening core and a 2½ in. rectifier type instrument housed in a smart black bakelite case. The magnetic joints of the core are self-aligning under the influence of a powerful spring thereby ensuring consistent accuracy of readings. The range selector switch is conveniently situated for thumb operation and the whole instrument is well balanced and easy to manipulate with one hand. The instrument is suitable for use on circuits of 50-70 c/s, but if specified at the time of ordering calibration can be carried out at a particular frequency. The ammeter can be used with safety on bare conductors up to 600 V a.c. The handle is slotted to take a carrying strap and, as an extra, a leather case with shoulder strap can be supplied. The new ammeter will be known as the Type 17L.

A Unique Table Lamp

OF very unusual design is a new table lamp now put on the market by FALK, STADELMANN AND CO., LTD., of 91 Farringdon Road, London E.C.1. The handsome solid cream "fluted dish" type exterior is mounted on satin silver metalwork. Twelve inches high, the lamp is wired with normal b.c. lampholder and will accommodate a 60 W lamp. It appears most suitable for hotel and restaurant use and, of course, in the home.

Below, the T.M.C. 7031 switch socket. Right, Falks' new table lamp.





AN OLD FRIEND RETIRES

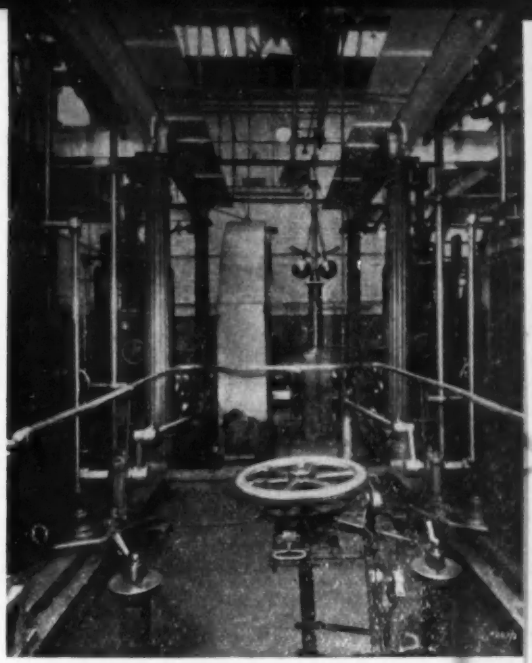
Cotton Mill Electrification Replaces a Beam Engine Almost a Century Old

A PROGRAMME of modernisation and electrification being carried out in the textile mills of John Lean and Sons, Ltd., of Glasgow, will shortly displace one of the oldest beam engines still working. This is of the twin coupled type; No. 1 engine (left hand in the photograph) was installed in 1858, and No. 2 in 1870. Both engines were built by Turnbull Grant and Jack, of Glasgow, and the pair between them develop 250 h.p. at 36 r.p.m. with steam at 55 lb/sq in. and 24 in. vacuum, cooling water being obtained from the Clyde (500 ft distant and a 20 ft lift) by two vertical pumps with leather clack valves. The flywheel, built in six segments, weighs 15 tons, is 15 ft diameter, has 133 double teeth of beechwood, and meshing with a 5 ft cast-iron spur wheel, on the main mill driving shaft.

An interesting feature is the emergency stop system. The handwheel of the main stop valve (foreground of illustration) is fitted with a weighted cable which tends to close it, and held open while running by a solenoid-operated pawl. Withdrawal of the pawl, by emergency switches in various portions of the mill, allows the weighted cable to close the valve.

The engine has, until recently, driven all the machinery in the mill consisting of a main shed on the ground floor and three main buildings, one five-storied, one four-storied, and one two-storied. The main shaft, 7 in. diameter, tapering to 3½ in., runs the full length of the weaving shed, and countershafts driven by cast-iron bevel wheels run across the shed. From these the looms are driven by belt. Power is transmitted to the upper floors in the storied buildings by means of vertical shafts and bevel gears. In all there is approximately 4,750 ft of shafting, requiring about 70 h.p. to drive it.

The firm now have about 700 looms with all the ancillary machinery for winding, warping, preparation and warehousing. They also have their own bleaching, finishing and packing plant. Of recent years many electrically-operated devices controlling the various processes have been installed.



The old beam engine

Electric Drives

The change over from steam to electrical drive is being undertaken by the firm's own engineering staff in collaboration with Grindlay, Ross & Co., Ltd., of 191 Holm Street, Glasgow. When the electrical installation is complete, there will be approximately 200 squirrel cage motors throughout the mill, ranging from 1/40 to 18 h.p. Most of the motors are of the totally enclosed, surface-cooled pattern, and where reasonably possible have a synchronous speed of 1,000 r.p.m. to facilitate maintenance. Where practicable "Vee" belt drives form the transmission from motor to line shaft or machine. The size and length of the "Vee" belts have been standardised to a great extent. In the weaving shed, group drives have been adopted, each motor driving the original line shaft which in turn serves 14/28 looms.

To save floor space the motors have been erected in an elevated position in the roof space, each situated at the centre of the line shaft with air break automatic push-button starters. The wiring to the motors in the weaving shed has been carried out in steel trunking, thus

eliminating the mass of separate conduit runs and distribution boards that would otherwise be employed; also the trunking will facilitate the wiring at some future date when group driving of the looms is replaced by individual drive, and since all the motors in the shed are in line, the trunking makes a tidy arrangement.

D.C. Gear

The Stenter (machine for drying the finished cloth) was originally fitted with d.c. motors, and these are being retained, as almost all the motors on this machine are of the variable speed type, with a complex system of electrical interlocks, together with two separate push-button control stations on different flats. To operate the Stenter a 45 kW 500 V single bulb mercury arc rectifier is installed in the switch-house adjoining the substation.

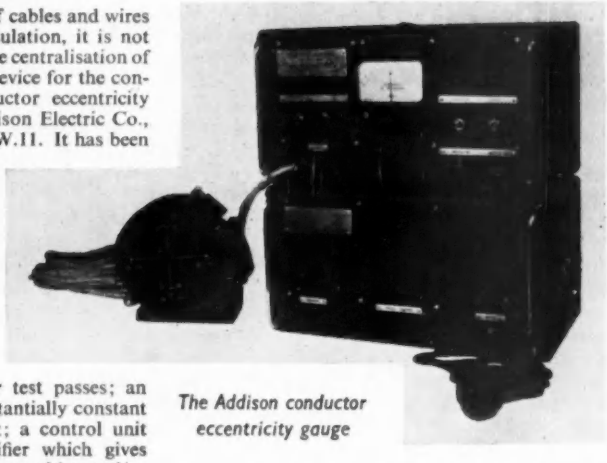
A new substation, equipped by the South-West Scotland Electricity Board, has been built into the new canteen building, across the street from the mill. Adjoining this is the main switch-room in which the main oil circuit-breakers and rectifier plant are installed, main cables being led underground across the street to serve the sub-main switchboard in the mill.

The firm was established in 1840 and catered almost exclusively for the Indian and Middle Eastern markets, although in the last 20 years the trade has become more diverse.

We are indebted to the South-West Scotland Electricity Board for the information concerning this change-over.

MEASURING CABLE ECCENTRICITY

DURING the manufacture of cables and wires covered with extruded insulation, it is not a simple matter to ensure absolute centralisation of the conductor. An interesting device for the continuous measurement of conductor eccentricity has been developed by the Addison Electric Co., Ltd., of Holland Park Avenue, W.11. It has been designed for continuous process control in the manufacture of conductors insulated with rubber or synthetic materials, as well as for laboratory and acceptance tests on the final product.



The Addison conductor eccentricity gauge

The equipment consists of three units—a gauge head comprising a coil system housed in a split cast iron case, through which the cable under test passes; an oscillator unit, supplying a substantially constant current to the cable under test; a control unit incorporating a detector amplifier which gives a direct reading of the extruding machine and/or the operation of warning signals should the eccentricity exceed a specified tolerance.

One oscillator and control unit can supervise a number of extruders simultaneously, provided each channel is furnished with its own gauge head. A manually or motor operated switch unit is employed in this case to transfer the oscillator output and amplifier input terminals, as well as any control lines, cyclicly from one measuring position to the next.

Operation

The principle of operation relies on the comparative measurement of the e.m.f.'s induced in the gauge-head coils by the a.c. field surrounding the conductor under test. The accuracy of the gauge is therefore independent of the diameter of the conductor and the type and thickness of insulation, and depends solely on the accuracy with which the cable or wire is guided through the gauge head, the eccentricity being expressed as the deviation of the axis of the conductor relative to the geometrical centre line of the gauge head.

Eccentricity measurements may be carried out also on braided metallic screens relative to an outer covering, if the current is injected into the screen instead of the core of the cable. Symmetrical multicore cables may be tested with respect to an outer covering by injecting the test current into all cores, and observing the periodic swing of the needle due to the helical lay of the conductors.

The standard gauge head allows for a maximum overall cable diameter of half an inch, the measuring range extending linearly from −0·5 mm. to +0·5 mm.

THE WEEK

INDUSTRY *in news* COMMERCE

Britain's Trade Centre in New York

BRITISH INDUSTRY now has a new headquarters in the centre of New York City. It is in East 53rd Street, off Fifth Avenue, in the real heart of the American capital.

Organised and managed by the British Commonwealth Chamber of Commerce in the U.S. it will provide information, advice and help to British industrialists on every aspect of exporting to the U.S. and will represent the views of British industry to the authorities and business world in the United States.

U.K. organisations participating are the Dollar Exports Board, The Federation of British Industries, the National Union of Manufacturers, the Scottish Council (Development and Industry), and B.E.T.R.O.

An important feature at the Centre is the provision of well equipped offices let on a day to day basis to visiting business men, together with the help of the residential staff for advice, in secretarial work, re-direction of mail and other vital routine work.

The services of the Centre are offered to all representatives of British industry whether or not they are members of participating organisations.

Works extended to Cope with New Goods for Dollar Export

NEW works are being built by Best Products Ltd., of Felixstowe. To be installed in the works is the latest type of electro-plating plant and equipment for bright nickel, bright chrome finishing and automatic polishing. Additional space is 5,000 sq ft, although this will be enlarged when work is under way on further extensions which have already been licensed.

These extensions will help in the improvement and greater productions of the company's existing range and of new products for the Canadian and home markets.

English Electric get ex-R.O. Factory

ANNOUNCEMENT by Board of Trade is to the effect that they have allocated the surplus Government factory at Clayton-Le-Moors, Accrington, to the English Electric Co. Ltd., for light engineering work and the manufacture of electrical equipment.

At present, Courtaulds Ltd. are in occupation but owing to re-organisation they are giving it up. English Electric will absorb the existing labour force.

New Scottish Electrical Society

RECENT formation in Scotland is that of the Dunfermline and District Electrical Society, formed in the centre of the Fifeshire area and near to Rosyth Dockyard where there are many electrical workers engaged on Naval constructional and repair work.

The committee expect much support from engineers in this neighbourhood, and at the time of going to press have enrolled 150 members.

Secretary is J. Thomas, ASSOC.I.E.E., c/o James Stott and Co., 97 Campbell Street, Dunfermline, and the first public meeting, "Magic of the Lamp," by T. S. Gavin, Esq., of B.T.H., Glasgow, is today at the Unitas Hall, Queen Anne Street, Dunfermline—7 p.m. A further seven monthly meetings have been arranged for members.

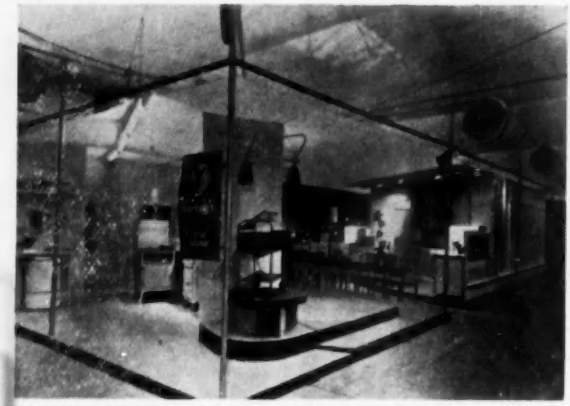
Shortage of Electricity a Handicap to Production

SPEAKING at the Humber Jubilee Convention at which Mr. Strauss, Minister of Supply, was present, Sir Wm. Rootes, K.B.E., chairman of the Rootes Group, pointed out as an impediment to rearmament and to our export trade the shortage of electric power which he emphasised was handicapping the manufacturer.

More electrical power, he said, was necessary to enable the manufacturers to use greater mechanisation and to bring the country into line with increased production per man as is the case in the U.S.A.

The First Half-Century

At the British Association the paper by Sir William Creeth described recent improvements in the induction method of communicating between two distant points. Telephonic communication has been successfully maintained between Rathlin Island and the mainland of Ireland since the early part of this year, a distance of over four miles. Sir William is confident that this system will develop into one of considerable practical and economical importance. Professor Oliver Lodge agreed on the future of the method for communication between island and shore, but did not agree that it would supersede the Hertzian wave or Marconi method for communicating between ships at sea.—*From our issue of September* 13, 1900.



E.D.A.'s "Electricity" stand at the "Food Fair" at Olympia featured a replica of the "Cooking Laboratory" of Philip Harben, the B.B.C. Television Chef. The stand, which displayed electrical equipment for domestic and commercial catering, attracted a large number of housewives who formed the predominant part of the visitors

Telcom to Re-appear in Korea

THE Telcom organisation, formed by Cable and Wireless Ltd. in 1944, to handle messages to and from the British Forces in Europe, the Middle East and S.E. Asia, has been re-organised for service in the Korean war. Plans have been made to send a wireless telegraph unit to Korea, and it will probably be in operation by mid-October.

The unit will be used to send war correspondents' despatches from the front as well as messages from the troops. It will operate from the company's station at Hongkong.

Plans have been approved by the United Kingdom Services and Government authorities and as soon as arrangements are complete, personnel and equipment will leave by air.

Newmans Get $200,000 Order from U.S.

AT THE conclusion of his visit to the works of Newman Industries Ltd., Yate, Bristol, Mr. W. W. Grainger, of Chicago, president of one of the largest firms distributing electric motors in the States, placed an order for electric motors to the value of $200,000.

This is the outcome of planned efforts on the part of the company to increase their dollar sales. These motors were designed to U.S. specifications (N.E.M.A. standards).

All-Britain T.V. by 1955

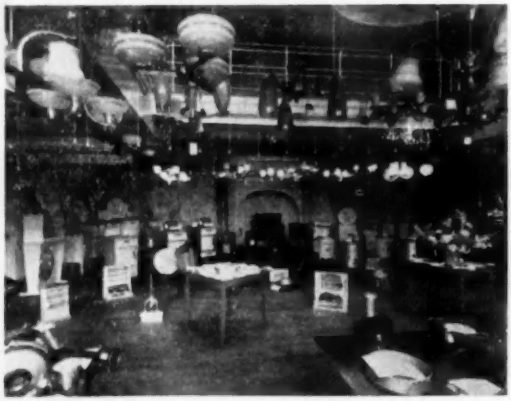
SPEAKING at a luncheon arranged by the Radio Industries Club of the Midlands at the Radio Exhibition in Birmingham, Mr. Norman Collins, B.B.C.'s Television Controller, forecast that a T.V. network, which would stretch across Britain, would be in operation by 1955.

Holme Moss transmitter would be in operation next summer, the Scottish transmitter by the end of 1951, and within four years the fifth and last station to serve Wales and the West of England would be completed.

Engineers in the B.B.C.

AN INTERESTING booklet with this title has been published by the B.B.C. for issue to universities and training colleges as a guide to graduates and undergraduates contemplating careers in this work. It surveys the whole field of radio and television engineering as from the B.B.C. angle and gives much detailed information about the organisation of the engineering division of the corporation and pay and prospects.

Below: The Metropolitan Distribution Co.'s new showroom at Truro opened recently by the Mayor of Truro. Right: The new Cleveleys showroom of the North Western Electricity Board, formerly a locally well-known antique shop



"Sieray" Show by Siemens

THE newest types of "Sieray" fluorescent fittings are specially featured in a display of decorative and industrial lighting fittings which is being held at the head office of Siemens Electric Lamps and Supplies Ltd., of 38-39 Upper Thames Street, London, and at the company's various branch showrooms during the week, September 18-22.

The display at Bristol will be held at Frankfort House, 17 Whiteladies Road, and at Birmingham in the Cobden Hotel, Corporation Street.

British Association Visits to Witton Works

DURING the session of the annual meeting of the British Association for the Advancement of Science at Birmingham recently, members of the Mathematics and Physics sections visited G.E.C.'s Witton Works.

The party which included Professor E. H. Neville, president of the section, toured the development laboratories and the high power testing station. The visitors saw extensions now well advanced which will enable circuit breakers up to 7,500 MVA to be tested and also saw demonstrations of h.v. phenomena in the 2½ million volt laboratory.

The following day a further party was conducted round the works. On each occasion the visitors were entertained at the Magnet Club.

Members of the British Association who visited G.E.C.'s Witton Works recently are seen here inspecting a rotor for a 30,000 kW turbo-alternator

Dealers Lamp Sales Aids

PLANNING of lamp sales campaigns for the coming winter is now in full swing and details are to hand this week of large-scale advertising campaigns by G.E.C. and Ekco-Ensign Ltd.

G.E.C.'s latest window displays for Osram lamps are of two types, in both of which the Osram symbols are treated with Dayglow paint, a new and appropriate substance which gives an effect of fluorescing in daylight. In one, the three Osram signs, supported by a dummy fluorescent lamp are treated with red, yellow and green Dayglow paint. The second shows a carbon emitting a shower of lamps at the touch of a magician's wand and is based on the slogan, now familiar to dealers, "Osram the Wonderful Lamp."

The "Wonderful Lamp" slogan also is used in an illuminated box-type window sign for general advertising. Dealers will have a special display unit in cardboard and plastic which has been produced to exhibit the Osram Silverlight lamp. A new coloured cut-out, showing four carbons in front of a blue panel will accompany the displays, while last year's cut-out of a carbon poised on the apex of a pyramid has been produced in revised colours. The new material and displays will be supported by Press advertising.

Ekco-Ensign Ltd. are planning their campaign to encourage the better use of lighting in general, and particular emphasis is being laid on "planned"

Below: Ecko-Ensign's new material. Right: The Osram Symbol created in a new way

Loading cases of electrical accessories for export from the works of the British General Mfg. Co. (1941) Ltd. Some 3,000 cases have been despatched in the first six months of this year, a figure which the company expects to beat in the second half of the year.

lighting in the home, offices, workshops and factories. Dealers will be supplied with showcards and a series of five cut-outs for counter and wall display. All feature the tungsten filament lamp with a reference in three of them to Ekco fluorescent lighting. One cut-out displays a selection from the range of filament lamps available, including the striplite, candle and tubular varieties. Window displays will be supported by advertisements in the national daily and weekly Press and in trade and technical journals. These will incorporate the new slogan "The Name is Ekco." In addition, literature will be available to be offered to the public and the contractor will be encouraged to specify and install Ekco-Ensign planned lighting.

Delivery within four weeks of receipt was a condition of an order recently received by Aberdare Cables Ltd., of South Wales, from the Egyptian Government. It was for 25,000 yards of underground cable, and within the prescribed time the whole order was on its way, contained on 60 drums, as seen above.

Cause for Alarm

OVER two miles of electric wiring connecting concealed contacts in doors with a master panel in the House Detective's office is a feature of the anti-burglar device now installed at Grosvenor House, Park Lane. Lights and meters on a control panel indicate the opening and closing of any external door in the hotel.

The alarm is set by a push-button device and as doors are moved buzzers are set off and warning lights flashed until switched off.

The firm which installed the alarm, Ideal Burglary and Fire Protection Corporation, also has a 999 system which, when interrupted, repeats to the police the name, address and 'phone number of the premises being burgled.

Singapore Post-war Exhibition

RADIOS, cookers, refrigerators and other household appliances and an illuminated display of airport lighting were among exhibits shown by the Singapore branch of the G.E.C. at the Singapore Post-war Exhibition held recently.

Intercom telephones proved popular among the Malay children in the 200,000 crowd which visited the exhibition at the Happy World Park. The stand won second prize in the competition for the best dressed stand.

Norwegian Company fit Decca Radar

IT IS announced by Decca Radar that they have received orders from Fred Olsen and Co., of Olsen, for the installation of Decca Marine Radar type 159 in 25 of their ships. This comprises all the Olsen line ships in service which are not already equipped with radar.

Exams in Salesmanship

THE pass list of the first examination in salesmanship held by the United Commercial Travellers' Association of Gt. Britain and Ireland has now been issued.

The "Herbert Davies" silver medal was awarded to W. J. T. K. Boyd, of Longniddry, E. Lothian. Nine candidates have been awarded a pass with distinction, whilst 96 candidates completed the examination and have been awarded the diploma.

For details of these examinations which are open to members and non-members, intending candidates should write to the head office of the Association.

Commercial Travellers Dinner-Dance

SILVER Jubilee year of the Electrical Trades Commercial Travellers' Association will be marked, the committee hopes, by great attendance at, and support for, the Annual Dinner-Dance which this

year is being held at the Cafe Royal, Regent Street, London W.1, on Friday, October 6. Tickets, 27s. 6d. each, can be obtained from Mr. H. Bowen, 69 Warwick Gardens, London W.14.

NEWS IN BRIEF

The East Midlands Electricity Board has recently been granted a coat-of-arms which is representative of the nine counties which come either wholly or partially in the Board's area.

Television's first picture book issued by the B.B.C., price 2s. 6d., is indeed interesting. It is, as might naturally be expected, "the twenty-year-old story of B.B.C. television told in pictures." Tracing the story from 16 Portland Place to Alexandra Palace on to Lime Grove Studios at Shepherds Bush, London, the book has much that will interest viewers and even non-viewers.

The qualifying and final examinations in "Sales Management," organised by the Incorporated Sales Managers' Association, will be held on December 7-9 next. Entry forms available from I.S.M.A. at 23 Bedford Square, W.C.1, must be returned by October 30.

Claimed to be Europe's most powerful diesel electric locomotive, the Sulzer 4,000 h.p. 225-ton machine, on the French National Railways, has completed over one million kilometres in express services with trains of 550-750 tons. Only minor repairs have been necessary. The locomotive now does the return trip from Lyons to Nice each day.

The Master Cutler, Mr. W. R. S. Stevenson, was guest of honour at a recent purchasing officer's dinner in Sheffield.

B.T.H. have received orders for the supply of marine radar equipment in the three sister ships of the Anglo-Saxon 28,000-ton tanker *Velutina*, for five new 28,000-ton "Cap" class tankers, and equipment with extended masts for six new 28,000-ton tankers under construction in British yards.

Electric Supply News

Axminster

Following representations on the subject of the accident in which two men in a yacht lost their lives when a mast struck an o.h. line across the River Axe, the South-Western Electricity Board is now contemplating reconstruction of the line to give a clearance of about 25 ft. on normal high water. This information was given at last week's meeting of the R.D.C.

Birmingham

The Corporation has been authorised by the Ministry of Health to place a contract for two 160 kW generating sets for installation at the Elan Valley waterworks. Estimated daily requirements of the Corporation plant there is 100 kW, the remainder being exported to the South Wales Electricity Board, under an agreement to which we have already referred.

Chadderton

Consent of the Minister of Fuel and Power to the development of the new Chadderton power station, Oldham, to its full capacity has been received by the B.E.A. Authorisation was given last January to the establishment of this station and the installation of one 60 MW turbo-alternator, two 360 k lb/hr boilers and a cooling tower. The new consent covers the installation of three more 60 MW sets, six 360 k lb/hr boilers and three cooling towers, to raise the station's total capacity to 240 MW. Constructional work on the station has already begun.

Chapel-en-le-Frith

The local town hall was the scene last Thursday of a get-together of representatives of the North Western Electricity Board, the consultative council, and the Buxton, New Mills and Glossop Hill farming executive committees of the N.F.U., on the question of extending electricity supplies into rural and remote areas. Mr. J. Harwood Lumsden, manager of the Board's No. 7 area, stated that of the 2,000 new connections in the past 2¼ years, only 30 were to farms, and stressed that capital cost was the important factor. The Board had earmarked £75,000 for rural development. Later, a resolution was passed deploring the policy of capital contribution in connection with rural supply, suggesting that such charges should be offset and equalised on installations where no capital outlay was required.

Edinburgh

At its meeting last week, the South-East Scotland Electricity Consultative Council agreed unanimously to pursue its efforts in support of the Electricity Board, to induce the Minister of Fuel and Power to return the £1,000,000 reserve funds existing in the South-East of Scotland area when the undertakings were nationalised. The Council had considered earlier correspondence on the matter, and the reply of the South-East Scotland Electricity Board dated August 26, to the Ministry of Fuel and Power. In this, the Board reiterated that in their opinion the retention of the South-East Scotland Local Authority general reserves, and the application of these reserves for the benefit of all other areas, has not been, and cannot be, justified on any grounds of equity. In an earlier letter of the Ministry of Fuel and Power to the Board it was stated that the Minister had given careful consideration to the representations of the Board, and felt it necessary "to point out that the 1947 Act contained no specific reference to the vesting of 'general reserve funds'." The vesting provision, it was stated, related to "property rights, liabilities, and obligations." So far as reserves were represented at the vesting date by investments or cash, they vested in the Central

Authority, so far as they were represented by other tangible assets, which had been bought out of money "ploughed back," no doubt they vested, in accordance with the provisions in the Act, either in the Area Board or in the Central Authority, according to whether they were assets mainly used in the distribution of electricity or mainly used in its generation. The Minister had concluded that the representations which the Board had made did not, as at present drawn, disclose any ground for action by the Minister under the sections quoted—namely, Sections 14 (4) and 19 (1) of the Act.

Ilkley

The Town Council last week had before it an application by the Yorkshire Electricity Board to erect an o.h. line across Ilkley Moor to a county police post at Whetstone Gate. The General Purposes Committee had recommended that, having regard to injury to amenities, and to the fact that the works are for the benefit of a department of the County Council, the county area planning officer should be asked to consider the local use of a generating set or other alternative means of obtaining a supply. Endorsing this recommendation, the Council decided to refuse an application for wayleave or easements until all alternative methods of obtaining a supply at the police post were considered.

N. of Scotland

The Loch Sloy hydro-electric station is to be formally inaugurated by H.M. The Queen on Wednesday, October 18. The scheme, begun in June, 1946, involved the construction of a dam 160 ft high and 1,160 ft long, the driving of a tunnel 1¾ miles long through a mountain, and the building of a power station on the shore of Loch Lomond. The station houses four vertical Francis turbines, each of 32,500 kW capacity, and a 450 kW auxiliary set.

A further stage in the North of Scotland Hydro-Electric Board's constructional schemes was reached last Thursday when 400 tons of rock were blasted from beneath Loch Fannich, Rossshire, to complete the 3½-mile tunnel which was commenced almost three years ago. A ton of explosives were electrically detonated by Lady MacColl, wife of Sir Edward MacColl, deputy chairman of the Board. The ceremony was the final stage in the execution of a portion in the construction of the Fannich Tunnel so as to enable the water stored in the loch to be used for generating power in Grudie Bridge power station, which lies 530 feet below the level of the loch. The tunnel enters the loch 81 feet below its surface.

South-Western

At the meeting of the South-Western Electricity Consultative Council last Friday, Mr. S. F. Steward, chairman of the Electricity Board, gave a review of the Board's financial position. Pointing out that during the next few years there would be very heavy additions to the Board's costs, he explained that large scale expenditure was unavoidable if the Board were to make good the effects of insufficient maintenance during the war years and if they were to make provision, as indeed they must, for extending and strengthening the networks for rural development and for carrying the load, which was increasing by about 10% each year. Even though the Board's programme was being cut down by the Government's policy of restricting capital expenditure, it was expected that by 1953 a sum approaching £15 million would have been spent on engineering works, and already some £4 million had been spent on developing and strengthening the networks to take supplies to rural areas. As a result, the Board's charges for interest and depreciation would increase substantially year by year. The Board were also having to pay an increased price for electricity purchased from the B.E.A. due to rising costs, while increases in salaries and wages were adding almost £100,000 to the annual bill.

It was reported that last December the Board estimated that a further 6,370 rural premises in the area, including 952 farms would be connected in the first half of this year. In fact, only 3,407 such premises including 410 farms had been connected. The figures for each county were given as: Somerset, 954 supplied (2,957 forecast); Devon, 812 (1,624); and Cornwall, 1,641 (1,789).

S.W. Scotland

A big reduction in the capital charge for connecting farms is announced by the South West Scotland Electricity Board. In future the maximum charge for leading in the main and providing a meter at any farm in the Board's area will be £100, irrespective of the distance from an existing source of supply. The charge to smallholders and crofters is on a down-graded scale, determined by negotiations with the local area manager. Mr. J. S. Pickles, chairman of the Board, last Thursday explained that this new plan of rural development was estimated to cost over £2,000,000. Half of the 10,000 farms in the Board's area are already connected.

LIGHTING SCHEMES

Birkenhead.—The first section of the scheme for improved lighting of Woodchurch Road was put into operation last week. Some 52 400 W mercury discharge lamps have been erected. The Watch Committee plan to extend the lighting to the remainder of Woodchurch Road.

Didcot (Berks).—A scheme, estimated to cost £2,760, for improved lighting, is under consideration.

Greenock.—The Streets Committee has recommended that sanction be obtained to proceed with the second stage of the re-lighting of the main thoroughfare through the town. In the first stage 87 sodium lamps were used.

Hastings.—The Highways and Works Committee has recommended that the Corporation should undertake the management and maintenance of the town's public lighting.

Company Activities

Britannia Electric Lamp Works

Group profit to March 31, after charging tax was £2,599 (*£12,396*). To taxation £8,900 (*£15,325*), holding company's profits after tax £6,222 (*£6,010*), proposed dividends £4,772 (*£7,707*).

Bylock Electric Ltd.

The directors have decided to defer consideration of a dividend on the Ordinary shares until the accounts for the year to July 31 are known. No Ordinary dividend has been paid for the past two years.

Christy Brothers (Chelmsford)

For the year to March 31, consolidated trading profit, plus interest, was £85,689 (*£50,610*). To depreciation £7,789 (*£5,716*), staff pensions £2,176 (*£2,235*), audit fee £398 (*£352*), deferred repairs for subsidiary company £1,500 (*£1,000*), subsidiary pension scheme £1,000 (*nil*), and provision for replacement of fixed assets £410 (*nil*), directors' emoluments, parent company £6,572 (*£5,628*), taxation £35,372 (*£17,921*), leaving profit £30,472 (*£17,758*). To subsidiary general reserve £8,801 (*nil*), depreciation reserve subsidiary nil (*£7,500*), contribution by subsidiary towards expenses of public issue nil (*£2,000*), off preliminary expenses nil (*£1,249*), dividends £6,325 (*£3,909*), leaving £18,446 (*£3,100*) carried forward, of which £13,735 (*£1,468*) is retained by subsidiaries.

Dorman Smith (Holdings)

Consolidated trading profit for the year to March 31 was £63,741 (*£84,987*), plus profit on sale of fixed assets £2,047 (*nil*). To loan and debenture interest nil (*£285*), depreciation £9,169 (*£9,898*), directors remuneration £7,166 (*£9,210*), audit fee £575 (*£648*), taxation £27,036 (*£42,446*), leaving net profit of £19,999 (*£22,502*). There is £3,446 (*£13,205*) brought in. Written off preliminary expenses nil (*£1,096*), Preference dividends £5,755 (*same*). Ordinary dividend 3% £2,887 (*same*), leaving £756 carried forward.

Electric Furnace Co.

For the year to March 31, consolidated trading profit was £75,683 (*£49,711*), plus dividends, etc. £2,825 (*£2,725*), exchange difference on revaluation of sterling £6,230 (*nil*),surplus on sale of motor vehicles £161 (*nil*), making £84,899 (*£52,436*). To director's emoluments £18,684 (*£16,637*), interest, etc. £6,129 (*£5,937*), audit fee, etc. £656 (*£603*), depreciation of fixed assets £9,017 (*£6,704*), leaving £50,413 (*£22,655*), plus £15,000 (*nil*) excess tax provision. To taxation £17,409 (*£14,460*), depreciation of investments—less £500 (*nil*) surplus provision for depreciation—£390 (*nil*), off preliminary expenses £50 (*nil*), off bomb damage expenditure—less nil (*£2,000*) tax allowance—nil (*£677*), leaving £31,969 (*£7,518*). To general reserve £20,000 (*nil*), stock reserve £5,000 (*nil*), dividends 8% £7,205 (*same*), leaving £13,403 (*£13,639*) carried forward.

Morgan Crucible Co.

Group trading profit after charging emoluments of directors of Morgan Crucible of £46,493 amounted to £1,230,019 (*£1,279,272*), plus investment income £33,109 (*£32,306*), making £1,263,128 (*£1,311,578*). To depreciation and amortisation of fixed assets £150,474 (*£136,741*), interest on employees loan obligations £266 (*£1,505*), audit fee £5,680 (*£4,616*), leaving £1,106,708 (*£1,168,716*), plus surplus trading provisions in respect of previous years £28,338 (*£26,393*), making group profit £1,135,046 (*£1,195,109*). To taxation, after deduction of surplus taxation provisions £591,298 (*£544,122*), dividends and profits attributable to minority interests in subsidiaries £40,797 (*£35,323*), leaving group profit attributable to Morgan Crucible £502,951 (*£615,664*), less profit retained in subsidiaries £136,886 (*£75,284*), leaving profit of Morgan Crucible £366,065 (*£540,380*). To dividends £229,045 (*same*), leaving £137,020 (*£311,335*), plus £148,808 brought in, less transfer to capital reserve, being amount capitalised by a wholly-owned subsidiary, £7,855 (*£7,250*), transferred to general reserve £150,000 (*£275,000*), leaving £127,973 carried forward by Morgan Crucible.

Murex Ltd.

Consolidated trading profit for the year to April 30 is £905,494 (*£874,268*). To depreciation of fixed assets £137,252 (*£131,115*), directors' remuneration £27,866 (*£34,728*), audit fee £944 (*£942*), pension fund, additional benefits provision, nil (*£19,500*), new issue expenses £6,492 (*nil*), taxation £399,444 (*£376,433*), leaving balance of £333,496 (*£311,550*). With £127,645 (*£125,395*) brought in, and surplus on sale of shares in associated company nil (*£41,425*), there is £461,141 (*£478,370*) available. To general reserve £210,000 (*£230,000*), dividends £120,725 (*same*), leaving £130,416 carried forward.

Dividends Declared

Brush Electrical Engineering Co. Interim Ordinary dividend of 4% (*same*) on increased capital.

Walsall Conduits Ltd. Interim dividend of 20% (*same*) payable on September 30.

Hubert Davies and Co. Interim Ordinary dividend of 7½%.

Sudan Light and Power. Dividend of 7½% (*same*). Profit for 1949, after taxation, is £29,745 (*£23,465*). There is £10,000 (*nil*) to general reserve and £45,504 (*£44,366*) carried forward.

Watford Electric and Manufacturing Co. Interim dividend of 5% (*same*).

Davis and Timmins. Interim of 10% (*same*).

Commercial Information

CONTRACTS OPEN

HOME

Sept. 15.—Belfast. Installation of suitable electric light fittings in large restaurant at Royal Victoria Hospital for N. Ireland Hospitals Authority. Purchasing Officer, Royal Victoria Hospital, Belfast.

Sept. 15.—Edinburgh. Electrical work for workshop at school of building and crafts. City Architect, City Chambers, Edinburgh 1.

Sept. 15.—Heywood T.C. Electric paper-baler and over-band magnetic separator for destructor works plant at Peel Lane. W. R. Parker, Town Clerk, Municipal Buildings.

Sept. 15. — Norwich T.C. Two hydro-pneumatically controlled, electrically driven pumping sets. Engineer and Manager, Water Department, City Hall, Norwich.

Sept. 15.—Peterborough. Electric lighting and power installations in 86 houses on the Crown St. estate. F. J. Smith, City Engineer and Surveyor, Town Hall. Deposit £2 2s. (See Sept. 7 issue.)

Sept. 16.—Ballymoney, Antrim. Reconstruction of control panels in Route Hospital and rewiring of hutment adjoining the hospital for N. Ireland Hospitals Authority. Secretary, N. Antrim Hospital Management Committee, Robinson Memorial Hospital, Ballymoney.

Sept. 16.—Lancashire C.C. Supply of electric lamps for 12 months beginning Nov. 1. County Architect, County Offices, Preston. Deposit £2.

Sept. 16.—Nasa U.D.C. Two electrically propelled pumps for sewerage purification works. A. D. Brennan, Deputy Town Clerk, U.D.C. offices.

Sept. 18.—Birmingham. Electric lighting and power installation at shops in Aston St. for Fire Brigade Committee. H. J. Manzoni, City Engineer and Surveyor, Civic Centre, Birmingham 1. Deposit £2 2s.

Sept. 18.—Fife. Electrical work in 32 houses at Aberdour for C.C. C. R. Douglas and Co., 15 East Port, Dunfermline.

Sept. 18.—Manchester. Electrical installation at the Deanery, Wood Road. City Architect Town Hall. Deposit £1 1s.

Sept. 18.—Salford T.C. Electrical installations at 4 shops, 4 maisonettes and 259 flats at Ladywell, Eccles New Road, Salford. City Engineer, Town Hall, Bexley Square, Salford 3. (See August 24 issue.)

Sept. 18.—Wrexham. Wiring for electric light and power of 70 houses at Trevor and 20 at Marchweil. D. E. Edwards, Engineer and Surveyor, Imperial Buildings, Regent St., Wrexham. Deposit £2 2s.

Sept. 20.—Tyne Improvement Commission. Five 10-ton electric grabbing cranes; also 1,400 ft of twin conveyor-belt lines capable of handling 2,000 tons/h. J. K. McKendrick, Secretary, Commission Offices, Berwick Street, Newcastle-upon-Tyne. Deposit £5 5s. each.

Sept. 21.—Arbroath. Electrical work in 48 houses at Cliffburn Rd. W. R. Samson, Housing Architect, Olympia Buildings, Market Place, Arbroath.

Sept. 21.—Blackburn T.C. Installation of street lighting in Whitebirk Road. Borough Engineer, Town Hall. (See Sept. 7 issue.)

Sept. 22.—Kidderminster T.C. Installation of electric lighting and heating points in 332 houses on various estates. J. G. Stewart, Borough Engineer and Surveyor, 110 Mill St., Kidderminster. Deposit £2 2s. (See August 31 issue.)

Sept. 23.—Holywood, N. Ireland. Electrical re-wiring of Croft House, Holywood. County Planning Officer, Court House, Downpatrick.

Sept. 25.—Dunstable. Supply, erection and wiring of concrete street lighting columns, 15 ft and 25 ft in height. R. R. Hole, Borough Surveyor, Municipal Offices.

Sept. 25.—Littlehampton U.D.C. Electrical installations in 18 houses at Wickbourne. Engineer and Surveyor, Council Offices, Littlehampton. Deposit £1 1s.

Sept. 25.—Manchester. Pumping plant and contingent works at Northenden. City Surveyor's Office, Design and Construction Section, Town Hall. Deposit £2 2s.

Sept. 25.—Swansea T.C. Electrical installation at West Cross primary school. Borough Architect, The Guildhall, Swansea. Deposit £2. (See Sept. 7 issue.)

Sept. 28.—Belfast. Electrical fittings and equipment and installation of cable for staff-calling systems, for N. Ireland Hospitals Authority at Musgrave Park Hospital. J. R. W. Murland, Consulting Engineer, 13 Wellington Place, Belfast. (Date altered from Sept. 14.)

Oct. 7.—Stepney. Installation of electric lighting, heating and power at 145 flats and houses in Bancroft Rd. A. A. Hudson, Borough Engineer and Surveyor, Municipal Offices, Duval St., E.1. Deposit £5 (Advertised in this issue.)

Oct. 13.—Belfast. Water screening plant of vertical rotating band type to deal with 2,880,000 gal/hr, for Harbour power station. Merz and McLellan, consulting engineers, Carliol House, Newcastle-upon-Tyne 1. Deposit £5 5s. (Advertised in this issue.)

Oct. 18.—Metropolitan Water Board. Two sets of electrically driven well and surface pumps for Chingford Mill pumping station, Hall Lane, Chingford. Chief Engineer's Department (Room 235), Offices of the Board, New River Head, Rosebery Avenue, E.C.1. Deposit £1 1s.

Oct. 20.—Carlisle. Six vertical spindle motor-driven pumps and accessories, capacity 38 million gal per day. L. J. A. Stow, City Engineer and Surveyor, City Engineer's Office, Carlisle.

No date stated.—Haddington. Installation of electricity in 250 houses at present lit by gas. Burgh Surveyor, 55 High St.

No date stated.—Leslie T.C. Electrical work in conversion of 12 houses at Cabbagehall. A. D. Haxton and Watson, Architects, Leven.

No date stated.—Midlothian. Electrical work in erection of 2 four-apartment at Deanpark,

Balerno, for C.C. County Architect, 32 Palmerston Place, Edinburgh 12.

No date stated.—Wem (Shrops) U.D.C. Wiring of 45 houses for electric light and power. F. Morcom, Barer House, Wem.

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference*

Sept. 21.—Wellington (N.Z.). 350 pilot lamps, 6·3 V, miniature bayonet base and tubular-shaped envelope for radio dial lights. N.Z. Post Office (Stores Division).

Sept. 22.—India. Electrical equipment for Directorate-General of Industries and Supplies, Shahjahan Road, New Delhi. Lampholders, wall plugs and sockets, ceiling roses, cut-outs, switches, brackets, lamp locks, soldering irons and electric heaters.

Sept. 22.—S. Rhodesia. Eight to 12 radio receivers and 6 to 10 portable turntables. Secretary, Tender Board, The Treasury, Vintcent Buildings, P.O. Box 125, Causeway, Salisbury. B.o.T. (Ref CRE (IB) 5534/49).*

Sept. 27.—Belgium. Parts and accessories for overhead electric cables for Belgian State Railways. B.o.T. (Ref. CRE (IB) 64081/50).*

Sept. 27.—Cape Town. 2,000 a.c. single-phase house service meters rated at 10 amp, 220 V, 50 c/s, 2-wire. City Electrical Engineer, Third Floor, Electricity House, Strand St., Cape Town.

Oct. 3.—S. Rhodesia. Supply of 30,000 dry cells telephone 1·5 V, at rate of 7,500 per quarter for Department of Posts and Telegraphs, Salisbury. Secretary, Tender Board, P.O. Box 123, Causeway, Salisbury.

Oct. 3.—Tangier. Total of 2,000 metres h.t. cables and 69 terminal and junction boxes, with insulating material. M. le Directeur de la Regie des Services de l'Eau et de l'Electricite, Tangier. B.o.T. (Ref. CRE (IB) 63502/50).*

Oct. 4.—Queensland. Supply, erection and maintenance of a radio communication system required by the Wide Bay Regional Electricity Board. Secretary, State Electricity Commission of Queensland, Scottish Union House, Eagle St., Brisbane. B.o.T. (Ref. CRE (IB) 63727/50).*

Oct. 6.—Uruguay. Two 3-phase induction motors of 120 h.p., 720 r.p.m., voltage 380/220, wound rotor, continuous operation with speed adjustment, for Gerencia Administrative de la U.T.E., Julio Herrera y Obes 1471, Montevideo. B.o.T. (Ref. CRE (IB) 62724/50).*

Oct. 10.—Wellington (N.Z.). 21,000 switchboard lamps, type B.Po. No. 2, carbon filament. Director-General (Stores Division), G.P.O., Wellington C.I.

Oct. 11.—Uruguay. 150 metres 3-phase rubber covered flexible cable for electric cranes, 220 V, for Administracion Nacional de Puertos. B.o.T. (Ref. CRE (IB) 63267/50).*

Oct. 12.—Brisbane. 4,000 kVA 50 c/s transformer for City Electric Light Co. Ltd., for use between 33,000 V system and 11,000 V hydro-electric system at Somerset Dam on Stanley River.

Oct. 25.—Cape Town. Supply of 3,800 230 V electric lamps for City Electricity Department. B.o.T. (Ref. CRE (IB) 63948/50).*

Oct. 26.—Brisbane. Metal-clad switchgear, 6 panels, 33 kV (3 feeder, 1 transformer, 1 bus tie and 1 bus section), 8 current transformer sets included in the panels, for City Electric Light Co. Ltd. B.o.T. (Ref CRE (IB) 64304/50).*

Nov. 14.—Wellington (N.Z.). 110 kV outdoor switchgear and steelwork for Kinleith substation for State Hydro-Electric Department. Deposit £100.

Nov. 16.—Portuguese West Africa. Transmission line from Mabubas hydro-electrical power station to substation at Luanda. Directorate General of Colonial Development, 13 Praca do Principe Real, Lisbon. Provisional deposit of £4,375 with Bank of Angola, Lisbon. B.o.T. (Ref. CRE (IB) 62304/50).*

Nov. 28.—Wellington (N.Z.). 50 kV outdoor switchgear and structure for Gisborne substation for State Hydro-Electric Department. Deposit £100.

Nov. 29.—Queensland. Two water-driven turbo-alternators, each of 18,000 kW at 11,000 V, for Tully Falls hydro-electric scheme, for the Cairns Regional Electricity Board. Particulars from Agent General for Queensland, 409-410 Strand, London. Deposit £A3 3s. (Advertised in this issue.)

Your Queries — Answered

"Aerovap" fly destroyer, makers of? T.E.—Shepherds Aerosols Ltd., 23a Old Bond St., W.1. (18697)

"York" electric cookers, makers of? B.C.—These were handled here by Eaton Canadian Products Ltd., 28 Mortimer St., W.1. (18714)

"Cepco" electric kettle, makers of? W.—These were made by Erinex Ltd., formerly of Flore, Northampton, but this concern has gone out of business. (18715)

"Connor" washing machines, agents for? L.E.C.—Sterling Engineering Co., Sterling Works, Dagenham, Essex. (18716)

"Rosamon" immersion heaters, makers of? S.E.—Heating Equipment Ltd., Hughenden Manor, Petersfinger, Alderbury, Salisbury, Wilts. (18717)

Intermediate pattern 5A silent switches, makers of? R.D.F.—A. P. Lundberg and Sons Ltd. (18718)

"Colombo" toasters, makers of? A.C.—These were made by Colombo Products Ltd., of Hampton Wick, Middx., but we can no longer trace this firm. (18720)

Mackie and Swaffield electric motors, spares for? G.S.B.—This firm went out of business some time ago. Some spares were later acquired by Sandelec Ltd., 133 Peckham Hill Street, S.E.15 (18721)

"Wynyates Ware" lighting fittings, makers of? R.C.H.—Brian Wynyates Smith, 99-101 New Summer Street, Birmingham 19, respond as the manufacturers. (18719)

ANSWER WANTED

"Autolux" automatic iron, makers of? D.D. (18725)

The above are selected from questions we have answered this week. If you have a query, send it to us.

Nov. 30.—Egypt. Electrically driven air compressor charging bottles, 3 diesel pumps, cooling tower. Chief inspecting engineer, Egyptian Government, 41 Tothill Street, S.W.1. (Ref. 74/GPR 50/42).

Dec. 18.—Biopio (Angola). Building of a dam, power station and substation. Direccao Geral do Fomento Colonial, Principe Real, 13 Lisbon.

Dec. 21.—Brisbane. 30,000 kW turbo-alternator and accessories consisting of turbine, alternator, condenser, regenerative feed-heating equipment for Bulimba "B" power station. City Electric Light Co. Ltd., Boundary St., Brisbane. B.o.T. (Ref. CRE (IB) 63728/50).*

TRADE NOTES

Change of Address.—B.V.C. Industrial Constructions Ltd. have changed their address to Terminal House, 52 Grosvenor Gardens, S.W.1. Also opened at these premises are the new export showrooms of the British Vacuum Cleaner and Engineering Co. Ltd.

Distributors.—Easco Electrical Ltd. have appointed Land Speight and Co. Ltd., 73 Robertson St., Glasgow C.2, as their distributors in Scotland.

Messrs. J. G. Coates Ltd., Thornybank Mill, Trafalgar St., Burnley, have been appointed distributors for Tilling-Stevens electric motors.

Metals Prices Up.—As from September 8, the price of good ordinary brand zinc was increased by £20 to £147 10s. per ton delivered. Good soft pig lead was also raised by £8 to £128 per ton delivered, with effect from September 9

More Depots.—Standard Telephones and Cables Ltd. have recently opened two new branch offices and depots. That at 167 Hockley St., Birmingham 19 (telephone Northern 2788) is under the management of Mr. D. J. Cater, and the other, at 59a Bath St., Glasgow C.2 (telephone Douglas 0519) is managed by Mr. W. Steven.

New Office.—Elexcel Ltd. have opened a Leeds office at Strowger House, 14 Hanover Square, Leeds 3. Telephone 30174. Their representative, Mr. A. H. Armitage, will be operating the East and West Riding territory from that address.

Representative.—Mr. J. L. Lovell, 3 Hazelton Rd., Bristol 7 (telephone 46968) is representing Elexcel Ltd. in the area of the South Western Electricity Board.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday evening)

	£ s. d.	New York price
COPPER, electrolytic	202 0 0	£196 0 0
Delivered in 2nd and 3rd month after order ...	215 10 0	—
Delivered in 4th, 5th and 6th month after order	217 0 0	—
LEAD, good soft pig (foreign)	128 0 0	128 0 0
,, ,, ,, ,, "English" quality	129 10 0	—
Delivered in 2nd and 3rd month after order, plus	7 0 0	—
TIN (99-99.75%) ... ... (Cash)	784-786	—
,, (3 months)	778-780	—
ALUMINIUM, commercial purity (del.) ...	112 0 0	—
ZINC	147 10 0	140 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.)	45 10 0	—
Mild Steel Tape (0.04 in.)	26 0 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

A. F. Gear Ltd. Resolution for voluntary winding-up passed at a meeting on August 18. A. W. Hunter of Latham and Co., 185-188 High Holborn, London W.C.1, appointed liquidator.

Hotric Ltd. Creditors to send particulars to David Morgan, 100 Park St., London W.1, liquidator, by Oct. 1.

The Premier Heating and Ventilation Co. Ltd. Meeting of members and creditors at A. C. Palmer and Co., Court Chambers, Friar Lane, Leicester, on September 25. Members, 11.30 a.m. and creditors 12 noon.

George Forrest and Son Ltd. A petition for winding-up will be heard on Oct. 9. Persons wishing to appear must notify Philip L. Ross and Co., 80 Wimpole St., London W.1, by Oct. 7.

Southdown Refrigeration and Equipment Co. Ltd. Meeting of creditors at 100 Park St., Grosvenor Sq., London W.1, on Sept. 19 at 12 noon to appoint liquidator and committee of inspection.

E. J. Pike (Radio Acoustics) Ltd. Meeting of creditors at 172 High St., Lowestoft, on Sept. 21 at 3 p.m. to appoint liquidator and committee of inspection.

Auto Electrical Services Co. (Reading) Ltd. Creditors to send particulars to A. W. Hunter, Certified Accountant, of Latham and Co., 185-188 High Holborn, W.C.1, liquidator, by Oct. 12.

Partnerships Dissolved

Dudley. Benjamin Homer and John Jevons, carrying on business as electricians, radio dealers and repairers of Wolverhampton St., Dudley, under style or firm of R.E.C. Stores. Partnership dissolved as from Aug. 28. Debts will be paid by John Jevons who will carry on the business.

Liverpool. Charles Donald Horton and Leslie Wright, carrying on business as electrical, radio and television engineers at 25 Lancelots Hey, Liverpool, under style or firm of Horton and Wright. Partnership dissolved from Aug. 31. Debts will be paid by Charles Donald Horton who will carry on the business.

BANKRUPTCY ACTS

Appointment of Trustee

Wigan. Bannister, John, carrying on business as electrical contractor at 2 The Wiend, Wigan. Trustee appointed: Eaves, Arthur Tydlesley, Chartered Accountant, 47 Mosley Street, Manchester 2.

Release of Trustee

Brentford. Draper, John Frederick, carrying on business as electrician at 230 Horn Lane, Acton, W.3. Trustee: Cyril Thomas Newman, 3 Central Buildings, Matthew Park St., Westminster, S.W.1, Official Receiver.

Intended Dividends

Ashton - under - Lyne. Ernest Cheetham of 24 Windsor Drive, Audenshaw, near Manchester, carrying on business as electrical contractor at 377 Ashton Old Rd., Manchester. Last day for receiving proofs, Sept. 22. Trustee: Fred Carter Ormrod, Official Receiver, 20 Byron St., Manchester.

Oxford. Frederick F. C. King, radio trader of 235 Banbury Rd., Oxford, carrying on business at that address and at 55 High St., 87 St. Aldates, and 227 Cowley Rd. Last day for receiving proofs, Sept. 25. Trustee: Cyril Thomas Newman, Official Receiver, 3 Central Buildings, Matthew Park, St. Westminster, S.W.1.

BUSINESS PROSPECTS

HOME

Alnwick R.D.C. Erection of 8 houses at Workworth. T. J. Cahill, Lloyds Bank Chambers, Alnwick.

Ayr T.C. Dean of Guild Court has approved plans for erection of 12 police houses at Craigie estate at estimated cost of £19,566.

Banstead (Surrey) U.D.C. Plans approved for erection of 32 flats at Preston Lane and 68 houses and 4 flats at Holly Hill.

Bognor Regis. Marcus King, Surveyor, 14 Station Rd., Crayford, Kent, proposes to erect 132 flats as well as shops and restaurant at The Esplanade at a cost of £750,000.

Bucklow (Cheshire) R.D.C. Erection of 16 houses at Aston-by-Budworth. H. V. Shaw, Council's Engineer and Surveyor, 26 Station Buildings, Altrincham.

Burnley. Tenders are invited in all trades for erection of 100 houses on Brunshaw estate. Borough Engineer, 22-24 Nicholas Street.

Chadwell Heath (Essex). Lewis Berger and Son, 35 Berkeley Sq., London W.1. are to build new factory on site adjoining their existing premises. J. Stanley Beard, Bennett and Wilkins, 101 Baker St., W.1.

Chapel-en-le-Frith R.D.C. Erection of 19 houses at Bamford. Pendleton and Dickinson, Architects, 16 Brazennose St., Manchester 2.

Coventry. Construction of college of art and technology in Civic Centre. Donald Gibson, City Architect and Planning Officer, 1a Warwick Row, Coventry.

Driffield (Yorks) R.D.C. Plans have been approved for erection of 28 houses on various sites.

Dumbarton. Approval has been received of plans for erection of school at West Bridgend and for adaptations to Pirniehall as a residential school. Estimated cost is £17,650.

Durham. Plans have been approved for erection of 8 houses at Framwellgate Moor, 57 at West Rainton and 196 at Sherburn. R.D.C. Surveyor, Byland Lodge, Durham. Also erection of secondary grammar technical school at Spennymoor and addition to Birtley library for C.C. G. R. Clayton, County Architect, Court Lane, Durham.

East Retford (Notts). Erection of 44 houses at Whinney Moor Lane. K. D. Hanna, Town Clerk, Municipal Offices.

Edinburgh T.C. Dean of Guild Court has approved the erection of a school and assembly hall at Moredun, at an estimated cost of £110,000.

Ellesmere (Salop). Erection of primary school for County E.C. Willink and Dod, Cunard Building, Liverpool 3.

Ely. Erection of infants' school at Downham Rd. R. D. Robson, County Architect, County Hall, March.

Eye. Erection of 12 houses at Victoria Hill. W. W. Scott Moncrieff, Council's Architect of Horsham, Diss.

Glasgow T.C. Dean of Guild Court has approved plans for building of over 600 houses at Merrylee Road.

Hamilton (Lanark). Dean of Guild Court has approved plans for erection of 120 houses at Laighstonehall and Fairhill.

Havant (Hants) U.D.C. Proposal to build 72 houses at Emsworth has been approved.

Herne Bay U.D.C. Erection of 20 flats in Victoria Park. A. S. Wilson and Partners, 8 Princes St., Storey's Gate, Westminster, S.W.1.

Houghton-le-Spring (Durham) U.D.C. Construction of 10 houses at Racecourse estate and 48 houses, bungalows and flats at Penshaw. W. H. Smith, Engineer and Surveyor, Scruton House, Newbottle Street.

Irthlingborough (Northants) U.D.C. Erection of 20 houses at Addington Rd. W. Wilson, Clerk of the Council, Council Offices, Station Road.

Kiveton Park (Yorks) R.D.C. Erection of 36 houses at Wales Rd. and 16 at Harthill. B. D. Thompson, Council's Architect, 83 Bridge St., Worksop.

Mansfield. Erection of 56 houses on Bancroft Lane estate. Borough Engineer and Surveyor, Carr Bank, Mansfield.

Morpeth R.D.C. Erection of 8 houses at Lynemouth. Manchlen and Weightman, 12 Saville Row, Newcastle.

North Riding. New health centre at Eston, child welfare centres at Saltburn and Richmond, and adaptations at Eston House being used as a nursery, for C.C. Also 10 firemen's houses at Northallerton and fire station at Skelton. County Architect, County Hall, Northallerton.

Northumberland C.C. is to proceed with installation of electric lighting at Newburn Westerhope county primary school.

Ogmore and Garw (Glamorgan). Erection of 24 houses at Llangeinor. W. T. Harris, Engineer and Surveyor.

Southampton T.C. Erection of 48 houses at Millbrook estate. Borough Architect, Civic Centre, Southampton.

Staffordshire C.C. Erection of county primary school at Yarnfield. Also additional classrooms at Watlands county primary school and extensions to Brewood grammar school. A. C. H. Stillman, Architect and Surveyor, Green Hall, Lichfield Rd., Stafford.

St. Helens T.C. Erection of 84 houses at the East Lancashire Rd. estate. M. Ward, Borough and Water Engineer, Town Hall.

Sunderland T.C. Ambulance depot for 15 vehicles at cost of £6,619. Also junior and infant school on Thorney Close estate for E.C.

Swansea. Erection of fire station at Reynoldston for C.C. L. R. Gower, County Architect, Glamorgan County Hall, Cardiff.

Wallasey T.C. Extension to Eastway school. Borough Architect, Town Hall.

Whitchurch (Salop) U.D.C. Erection of 12 houses at Smallbrook Rd. site. Frank Clayton, Clerk of the Council, Council Offices.

Wigton. R.D.C. to build 24 houses at Waverton.

OVERSEAS

Ahmedabad. Mr. C. M. Patel of Bharat Electric Co. requires plant for manufacture of conduits and lamp bulbs. He is staying at 42, Hunter St., London W.C.1.

Winnipeg. Equipment needed for technical-vocational high school, damaged by recent floods, at special prices, including welding equipment, signal generators (crystal controlled), radio receiver, motor generator set, motors, transformers, drill presses, etc. B.o.T. (Ref. CRE (IB) 61906/50).*

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Davis and White, Ltd., 10 Ashley Gardens, Richmond, Surrey. To carry on business of manufacturers of and dealers in plant, machinery, tools, etc. Cap.: £1,000 in £1 shares. Permanent dirs.: R. W. Davis and E. G. White.

Eagle Refrigeration Co. Ltd. Cap.: £1,000 in £1 shares. Dirs.: to be appointed by subs. Subs.: R. Taylor, 14 Lancaster Avenue, Hitchin, Herts, and J. L. Sykes, Evesbatch, High St., Stevenage, Herts.

Sir George Godfrey and Partners Ltd. To acquire certain assets which belong to and form part of the undertaking of Godfrey Assets, Ltd., and to carry on business of manufacturers of and dealers in mechanical, electrical, pneumatic and general power devices, etc., relating to aeroplanes and other aircraft. Cap.: £100,000 in £1 shares. Dirs.: W. D. L. Theed, Fenny Lodge, Wargrave, Berks; R. Knight, Beacon Hill, Manor Rd., Penn, Bucks; G. N. Kingsford; R. W. Everall; and N. Anderson, addresses not stated.

Sir George Godfrey and Partners (Industrial) Ltd. To acquire certain assets which belong to or form part of the undertaking of Godfrey Assets, Ltd., and to carry on the business of manufacturers of and dealers in mechanical, electrical, pneumatic and general power devices relating to motor cars, lorries, trucks, omnibuses, coaches, motor ships, motor boats and vessels, etc. Cap.: £30,000 in £1 shares. Dirs: W. D. L. Theed, R. Knight, G. N. Kingsford and H. Fisher.

Harden Valve Co. Ltd., 89 Cornwall St., Birmingham 3. To carry on business of manufacturers of hand, mechanically or automatically actuated valves of all kinds for the control of passage of air or gases or fluids, etc. Cap.: £1,000 in £1 shares. Dirs.: C. R. Jordan, Alice B. Jordan and J. D. Beck.

Heaven Dowsett and Co. Ltd., 315 Wellington Rd., Birmingham. To take over business of a manufacturer and merchant of insulating materials carried on at Birmingham by Percy S. Dowsett. Cap.: £10,000 in £1 shares. Dirs.: P. S. Dowsett, Mrs. A. Dowsett and P. R. Dowsett, 184 Bedford Rd., Four Oaks, Sutton Coldfield.

Magnetic Instruments Ltd., To carry on business of manufacturers of and dealers in recording apparatus and instruments, etc. Cap.: £1,000 in £1 shares. Dirs.: K. A. Stephenson, 60 Ellison Rd., Sidcup, Kent, and Adelaide B. Golding.

Negatron Ltd., 3 Springfield St., Warrington, Lancs. To carry on business of manufacturers and installers of neon and fluorescent lighting equipment, etc. Cap.: £5,000 in £1 shares. Dirs.: C. Bradshaw, E. J. Bradshaw and N. Neatham.

Phillips and Dart, Electrical, Ltd., 105 Western Rd., Hove. To carry on business of manufacturers of and dealers in electrical apparatus and fittings, etc. Cap.: £500 in £1 shares. Permanent dirs.: L. F. Dart and Mrs. F. E. Dart.

R. S. Patents Ltd., Bridge St., Ebley, near Stroud, Glos. To acquire industrial, commercial, electrical, mechanical, engineering and domestic patents, etc. Cap.: £500 in 450 cumulative preference shares of £1 and 1,000 ordinary shares of 1/- each. Permanent dir.: C. T. R. Shepheard.

Ruco Products (Radio) Ltd., 197 Lower Richmond Rd., Richmond, Surrey. Cap.: £1,000 in £1 shares. Dirs.: A. R. Surtees and A. L. Leeson.

Soundsense Ltd. To carry on business of dealers in and exporters and importers and manufacturers of sound amplifying and recording and reproducing apparatus, etc. Cap. £1,000 in £1 shares. Dirs.: not named. Subs.: E. A. Grainger, 94 The Avenue, West Ealing, W.13, and P. T. Humphrey, 27 Boileau Rd., Ealing, W.5.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Etronivision 689,364 and **Teletronic** 689,365. Class 9. Television, wireless, telegraphic instruments and apparatus. Hale Electric Co., Ltd., Talbot Road, West Ealing, London W.13.

Heatrola. B663,351. Class 11. Installations for heating, steam generating, cooking, drying, ventilating and hot water supply purposes. Noma Electric Corpn., 55, West 13th Street, New York.

Koolohm. 676,935. Class 9. Electrical resistors. Sprague Products Coy. Inc., 210 Beaver Street, North Adams, Mass.

Mermaid. 687,152. Class 7. Washing machines. Wm. E. Cary, Ltd., Manchester Spring and Axle Works, Red Bank and Adeline Street, Manchester 4.

Signal-Stat. B689,201. Class 9. Switches for use with directional signal indicating lamps for vehicles. Signal-Stat Corporation, 1430 Herkimer Street, Brooklyn (23), New York, U.S.A. Address for service: c/o C. Lockett-Hughes, 46 Bedford Row, London W.C.1.

Teasy. 689,240. Class 9. Tea kettles, tea pots and tea infusers, all being electrically operated. A. Smail, "Little Barr," West Drive, Wentworth, Surrey.

Udec in diamond design. 689,232. Class 11. Installations for refrigerating. U. D. Eng. Co., Ltd., Cumberland Avenue, Park Royal, N.W.10.

Volex-Nicromoly. 689,245. Class 6. Cast alloys (partly wrought) of iron with nickel, chromium and molybdenum. T. E. Salter Ltd., Richmond House, Bloomfield Road, Tipton, Staffs.

MEETINGS TO NOTE

THURSDAY, SEPT. 14

INST. OF PRODUCTION ENGRS. (Southern section).—Mr. E. J. B. Willey on "Electronics in Industry." Polygon Hotel, Southampton. 7 p.m.

R. PHOTOGRAPHIC SOC. ANNUAL EXHIBITION OF PHOTOGRAPHY. 16 Princess Gate, London S.W.7. (Until Oct. 15).

DUNFERMLINE ELECTRICAL SOCIETY.—"From Filament to the Modern Fluorescent." T. S. Gavin. Unitas Hall, Queen Anne St.—7 p.m.

FRIDAY, SEPT. 15

ELECTRICAL INDUSTRIES BENEVOLENT ASSOC.—Annual meeting at I.E.E. Offices, Savoy Place, London W.C.2. 11.30 a.m.

MONDAY, SEPT. 18

INTER. MECH. ENGRG. CONGRESS.—(Until Sept. 23). Brussels.

ASSN. PUBLIC LIGHTING ENGRS.—Annual meeting and conference (until Sept. 23). Winter Gardens, Bournemouth.

A.S.E.E. (Central London branch).—"Radio Interference Suppressors." H. Andrewes. St. Ermins Hotel, S.W.1.—6.50 p.m.

A.S.E.E. (Stockport branch).—"Lighting." Mr. Gosst. White Lion Hotel, Underbank.—8 p.m.

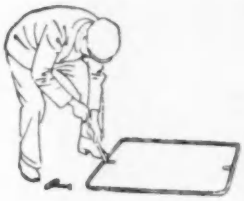
BIRMINGHAM ELECTRICAL SOCIETY.—Presidential address. A. T. Haywood, Grand Hotel.—6.15 p.m.

WEDNESDAY, SEPT. 20

A.S.E.E. (Manchester branch).—Film show at Engineers' Club, Albert Square.—7.30 p.m.

Note these features

The unique features embodied in the construction of the 'Holborn' Frame and Cover have ensured its popularity amongst users all over the world.



1. **THE COVER SLIDES** easily into and out of the Frame.
2. **ROUNDED CORNERS** give added strength to resist breakage in transit and handling. Fig. 1.
3. **EASY TO REMOVE**—The inclined section prevents dirt and foreign matter wedging the joint. Fig. 2.
4. **NON-SLIP.** Narrow raised serrated edges, scarcely noticed in made-up pathway, minimise slipping by pedestrians.
5. **CORRECT POSITIONING** of cover in frame is ensured by special combined location and pinch bar slot.
6. **TESTS FOR STRENGTH.** Larger size pavement frames and covers were proven in successful weight tests of over 3 tons dead load and half a ton rolling load.
7. **NAME PLATES** available. Loose cast iron plates avoid the necessity of specially cast covers.
8. **WIDE RANGE OF SIZES** to meet all normal requirements.

FIG. 1

FIG. 2

Ask for Catalogue 28

HENLEY

"HOLBORN" PAVEMENT FRAMES AND COVERS

(Covers are supplied without concrete filling.)

W. T. HENLEY'S TELEGRAPH WORKS COMPANY LTD. 51-53 HATTON GARDEN LONDON, E.C.1.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Davis and White, Ltd., 10 Ashley Gardens, Richmond, Surrey. To carry on business of manufacturers of and dealers in plant, machinery, tools, etc. Cap.: £1,000 in £1 shares. Permanent dirs.: R. W. Davis and E. G. White.

Eagle Refrigeration Co. Ltd. Cap.: £1,000 in £1 shares. Dirs.: to be appointed by subs. Subs.: R. Taylor, 14 Lancaster Avenue, Hitchin, Herts, and J. L. Sykes, Evesbatch, High St., Stevenage, Herts.

Sir George Godfrey and Partners Ltd. To acquire certain assets which belong to and form part of the undertaking of Godfrey Assets, Ltd., and to carry on business of manufacturers of and dealers in mechanical, electrical, pneumatic and general power devices, etc., relating to aeroplanes and other aircraft. Cap.: £100,000 in £1 shares. Dirs.: W. D. L. Theed, Fenny Lodge, Wargrave, Berks; R. Knight, Beacon Hill, Manor Rd., Penn, Bucks; G. N. Kingsford; R. W. Everall; and N. Anderson, addresses not stated.

Sir George Godfrey and Partners (Industrial) Ltd. To acquire certain assets which belong to or form part of the undertaking of Godfrey Assets, Ltd., and to carry on the business of manufacturers of and dealers in mechanical, electrical, pneumatic and general power devices relating to motor cars, lorries, trucks, omnibuses, coaches, motor ships, motor boats and vessels, etc. Cap.: £30,000 in £1 shares. Dirs: W. D. L. Theed, R. Knight, G. N. Kingsford and H. Fisher.

Harden Valve Co. Ltd., 89 Cornwall St., Birmingham 3. To carry on business of manufacturers of hand, mechanically or automatically actuated valves of all kinds for the control of passage of air or gases or fluids, etc. Cap.: £1,000 in £1 shares. Dirs.: C. R. Jordan, Alice B. Jordan and J. D. Beck.

Heaven Dowsett and Co. Ltd., 315 Wellington Rd., Birmingham. To take over business of a manufacturer and merchant of insulating materials carried on at Birmingham by Percy S. Dowsett. Cap.: £10,000 in £1 shares. Dirs.: P. S. Dowsett, Mrs. A. Dowsett and P. R. Dowsett, 184 Bedford Rd., Four Oaks, Sutton Coldfield.

Magnetic Instruments Ltd., To carry on business of manufacturers of and dealers in recording apparatus and instruments, etc. Cap.: £1,000 in £1 shares. Dirs.: K. A. Stephenson, 60 Ellison Rd., Sidcup, Kent, and Adelaide B. Golding.

Negatron Ltd., 3 Springfield St., Warrington, Lancs. To carry on business of manufacturers and installers of neon and fluorescent lighting equipment, etc. Cap.: £5,000 in £1 shares. Dirs.: C. Bradshaw, E. J. Bradshaw and N. Neatham.

Phillips and Dart, Electrical, Ltd., 105 Western Rd., Hove. To carry on business of manufacturers of and dealers in electrical apparatus and fittings, etc. Cap.: £500 in £1 shares. Permanent dirs.: L. F. Dart and Mrs. F. E. Dart.

R. S. Patents Ltd., Bridge St., Ebley, near Stroud, Glos. To acquire industrial, commercial, electrical, mechanical, engineering and domestic patents, etc. Cap.: £500 in 450 cumulative preference shares of £1 and 1,000 ordinary shares of 1/- each. Permanent dir.: C. T. R. Shepheard.

Ruco Products (Radio) Ltd., 197 Lower Richmond Rd., Richmond, Surrey. Cap.: £1,000 in £1 shares. Dirs.: A. R. Surtees and A. L. Leeson.

Soundsense Ltd. To carry on business of dealers in and exporters and importers and manufacturers of sound amplifying and recording and reproducing apparatus, etc. Cap. £1,000 in £1 shares. Dirs.: not named. Subs.: E. A. Grainger, 94 The Avenue, West Ealing, W.13, and P. T. Humphrey, 27 Boileau Rd., Ealing, W.5.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Etronivision 689,364 and **Teletronic** 689,365. Class 9. Television, wireless, telegraphic instruments and apparatus. Hale Electric Co., Ltd., Talbot Road, West Ealing, London W.13.

Heatrola. B663,351. Class 11. Installations for heating, steam generating, cooking, drying, ventilating and hot water supply purposes. Noma Electric Corpn., 55, West 13th Street, New York.

Koolohm. 676,935. Class 9. Electrical resistors. Sprague Products Coy. Inc., 210 Beaver Street, North Adams, Mass.

Mermaid. 687,152. Class 7. Washing machines. Wm. E. Cary, Ltd., Manchester Spring and Axle Works, Red Bank and Adeline Street, Manchester 4.

Signal-Stat. B689,201. Class 9. Switches for use with directional signal indicating lamps for vehicles. Signal-Stat Corporation, 1430 Herkimer Street, Brooklyn (23), New York, U.S.A. Address for service: c/o C. Lockett-Hughes, 46 Bedford Row, London W.C.1.

Teasy. 689,240. Class 9. Tea kettles, tea pots and tea infusers, all being electrically operated. A. Smail, "Little Barr," West Drive, Wentworth, Surrey.

Udec in diamond design. 689,232. Class 11. Installations for refrigerating. U. D. Eng. Co., Ltd., Cumberland Avenue, Park Royal, N.W.10.

Volex-Nicromoly. 689,245. Class 6. Cast alloys (partly wrought) of iron with nickel, chromium and molybdenum. T. E. Salter Ltd., Richmond House, Bloomfield Road, Tipton, Staffs.

MEETINGS TO NOTE

THURSDAY, SEPT. 14

INST. OF PRODUCTION ENGRS. (Southern section).—Mr. E. J. B. Willey on "Electronics in Industry." Polygon Hotel, Southampton. 7 p.m.

R. PHOTOGRAPHIC SOC. ANNUAL EXHIBITION OF PHOTOGRAPHY. 16 Princess Gate, London S.W.7. (Until Oct. 15).

DUNFERMLINE ELECTRICAL SOCIETY —"From Filament to the Modern Fluorescent." T. S. Gavin. Unitas Hall, Queen Anne St.—7 p.m.

FRIDAY, SEPT. 15

ELECTRICAL INDUSTRIES BENEVOLENT ASSOC.—Annual meeting at I.E.E. Offices, Savoy Place, London W.C.2. 11.30 a.m.

MONDAY, SEPT. 18

INTER. MECH. ENGRG. CONGRESS. —(Until Sept. 23). Brussels.

ASSN. PUBLIC LIGHTING ENGRS.—Annual meeting and conference (until Sept. 23). Winter Gardens, Bournemouth.

A.S.E.E. (Central London branch). —"Radio Interference Suppressors." H. Andrewes. St. Ermins Hotel, S.W.1.—6.50 p.m.

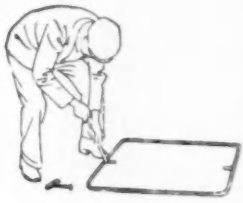
A.S.E.E. (Stockport branch).—"Lighting." Mr. Gostt. White Lion Hotel, Underbank.—8 p.m.

BIRMINGHAM ELECTRICAL SOCIETY. —Presidential address. A. T. Haywood, Grand Hotel.—6.15 p.m.

WEDNESDAY, SEPT. 20

A.S.E.E. (Manchester branch).—Film show at Engineers' Club, Albert Square.—7.30 p.m.

Note these features



The unique features embodied in the construction of the 'Holborn' Frame and Cover have ensured its popularity amongst users all over the world.

1. **THE COVER SLIDES** easily into and out of the Frame.
2. **ROUNDED CORNERS** give added strength to resist breakage in transit and handling. Fig. 1.
3. **EASY TO REMOVE**—The inclined section prevents dirt and foreign matter wedging the joint. Fig. 2.
4. **NON-SLIP.** Narrow raised serrated edges, scarcely noticed in made-up pathway, minimise slipping by pedestrians.
5. **CORRECT POSITIONING** of cover in frame is ensured by special combined location and pinch bar slot.
6. **TESTS FOR STRENGTH.** Larger size pavement frames and covers were proven in successful weight tests of over 3 tons dead load and half a ton rolling load.
7. **NAME PLATES** available. Loose cast iron plates avoid the necessity of specially cast covers.
8. **WIDE RANGE OF SIZES** to meet all normal requirements.

FIG. 1

FIG. 2

Ask for Catalogue 28

HENLEY

"HOLBORN" PAVEMENT FRAMES AND COVERS

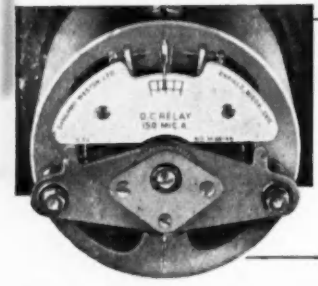
(Covers are supplied without concrete filling.)

W. T. HENLEY'S TELEGRAPH WORKS COMPANY LTD.
51-53 HATTON GARDEN
LONDON, E.C.1.

FEATURES OF WESTON SUPERIORITY

Weston
MOVING COIL RELAYS

This modern range of relays is ideal for all Laboratory or Industrial Purposes. Built on the permanent-magnet moving coil principle, unaffected by external magnetic fields, the precious metal contacts will not oxidise or tarnish, and the high torque developed ensures positive contact pressure. Supplied in Bakelite casing. Most applications call for special requirements and enquiries should therefore enclose a diagram of the circuit to be closed and state (a) High and/or low contact adjustment; (b) mounting position; (c) resistance; (d) values of current and voltage in local circuit and whether DC or AC; (e) values of resistance and any inductance or capacitance in local circuit; and (f) any special accuracy required. Every 'Weston' relay is specially designed to give the best possible performance for its individual purpose. (The Model illustrated is S54.)



ACCURACY OF ADJUSTMENT. Special note should be made of the reduction gearing which enables the *user* to make accurate adjustment with absolute ease. The accuracy and rigidity of the mounting ensures constant centring after adjustment. Yet another special 'Weston' feature.

SANGAMO WESTON LIMITED

ENFIELD, MIDDLESEX: Telephone: Enfield 3434 (6 lines) & 1242 (4 lines) Telegrams: Sanwest, Enfield.
DEPOTS AT GLASGOW, NEWCASTLE-ON-TYNE, LEEDS, MANCHESTER, WOLVERHAMPTON, BRISTOL, LIVERPOOL, NOTTINGHAM, SOUTHAMPTON, LONDON, IPSWICH AND BRIGHTON.

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CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS | WANTED, FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 35s. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

METROPOLITAN BOROUGH OF STEPNEY

INSTALLATION OF ELECTRIC LIGHTING, HEATING, AND POWER, ETC., AT THE 145 DWELLINGS IN FLATS AND HOUSES TO BE ERECTED AT THE BANCROFT ROAD HOUSING SCHEME (SECOND PORTION)
CONTRACT NO. 689

NOTICE is hereby given that the Council of the Metropolitan Borough of Stepney will receive tenders from such persons as may be willing to enter into a contract for providing all necessary labour and materials required for the installation of the Electric Lighting, Heating, and Power Points at the above-mentioned housing scheme.

The House of Commons Fair Wages Clause will apply.

Contractors will be prohibited from assigning or underletting their contract without the written consent of the Council previously obtained.

The drawings and documents are to be inspected at the Council's offices, by persons desirous of submitting tenders, prior to making the deposit hereunder, in order to satisfy themselves that they can undertake the work.

Copies of stipulations (including form of tender), schedules, specifications, and plans of the buildings may be obtained upon application to A. A. Hudson, Esq., A.M.Inst.C.E., A.R.I.C.S., M.I.Mun.E., A.M.I.Struct.E., A.M.T.P.I., Borough Engineer and Surveyor, Municipal Offices, Duval Street, E.1, upon payment of a deposit of £5, which will be refunded to bona fide tenderers (subject to the return of all plans and documents issued).

Tenders and documents, etc., sealed in the envelopes supplied, must be forwarded to the undersigned so as to arrive at this office not later than Saturday, October 7, 1950.

The Council do not bind themselves to accept the lowest or any tender, and the acceptance of a tender or tenders will be subject to the obtaining by the Council of any requisite consents.

By Order of the Council.

J. E. ARNOLD JAMES,
Town Clerk.

Municipal Offices,
London Fruit Exchange,
Duval Street, E.1.
September 13, 1950. (G 99)

THE STATE ELECTRICITY COMMISSION OF QUEENSLAND

AUSTRALIA

TENDERS are invited by the State Electricity Commission of Queensland on behalf of the Co-ordinator General of Public Works, Queensland, and the Cairns Regional Electricity Board, Queensland, for the supply, delivery, erection, and maintenance of the following:—

SPECIFICATION NO. T.F.1

Two (2) 18,000 kW, 11,000 V, water-driven Turbo Alternators, to operate on a gross head of about 1,485 ft, at Tully Falls, North Queensland.

Specifications, tender forms, and full details are available for inspection at the offices of Commercial Relations and Export Department of the Board of Trade, London; Agent-General for Queensland, 409-410 Strand, London, and may be obtained from The State Electricity Commission by the payment of £3/3/- Australian currency for the first copy and £1/1/- Australian currency for each additional copy. The cost of the first copy will be refunded upon receipt of a bona fide tender.

Sealed tenders, which must be endorsed as specified, will be received at the office of The State Electricity Commission of Queensland, Scottish Union House, Eagle Street, Brisbane, Queensland, up to 3 p.m. on November 29, 1950.

The lowest or any tender not necessarily accepted.

R. W. PICKING,
Acting Secretary.
(G 100)

COUNTY BOROUGH OF BELFAST

Electricity Department

WATER SCREENING PLANT

TENDERS are invited for the supply, delivery, and erection at the Harbour Power Station, Belfast, of circulating Water Screening Plant of the vertical rotating band type, capable of dealing with 2,880,000 gallons of water per hour.

Form of tender (No. N.952), in quadruplicate, conditions, specification, and drawings, may be obtained from Messrs. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne 1, on payment of a deposit of five guineas (cheques to be made payable to the Belfast Corporation Electricity Department), which deposit will be refunded provided a bona fide tender be lodged and not withdrawn. Extra copies of the contract documents may be obtained at three guineas per set, which sum will not be returnable.

Each tender, in quadruplicate, in sealed envelope marked "Tender for C.W. Screening Plant, Harbour Power Station," and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, October 13, 1950.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
September 8, 1950. (G 98)

COUNTY BOROUGH OF SWANSEA

West Cross Primary School, West Cross, Swansea

TENDERS FOR ELECTRICAL INSTALLATION

FIRMS wishing to tender for the Electrical Installation at the West Cross Primary School now in course of erection at West Cross, Swansea, are invited to submit their applications to the Borough Architect, The Guildhall, Swansea, on or before September 25, 1950.

Plans, specifications, and conditions of contract can be obtained on application and deposit of £2, provided the applicant gives satisfactory evidence of having previously carried out work of a similar character.

The deposit will be refunded after delivery of a bona fide tender (which is not subsequently withdrawn) and the return of all documents.

No guarantee is given that the lowest or any other tender will be accepted.

T. B. BOWEN,
Town Clerk.

The Guildhall, Swansea. (G 8)

APPOINTMENTS VACANT

BRITISH ELECTRICITY AUTHORITY

Chief Engineer's Department, London

FEMALE TRACERS—DRAWING OFFICE

APPLICATIONS are invited for vacancies in the Drawing Office of the Chief Engineer's Department at Headquarters in London, for Female Tracers.

The starting salary for the appointments, which are superannuable, will be within the General Clerical Grade of the National Joint Council, ranging from £123 per annum at age 16, and rising by annual increments to £278 per annum at 26 and to an ultimate maximum of £339 per annum, including London Allowance in each case.

Application forms may be obtained from D. Moffat, Director of Establishments, British Electricity Authority, British Electricity House, Great Portland Street, London W.1, and should be completed and returned to him not later than October 2, 1950. Please quote reference AE/94.
(G 70)

BRITISH ELECTRICITY AUTHORITY

Research Branch,
Chief Engineer's Department, Headquarters

GENERAL ASSISTANT ENGINEER

APPLICATIONS are invited for the appointment of a General Assistant Engineer in the Electro-Technical Research Section of the Research Branch in London.

The salary for the appointment, which is superannuable, will be within the scale £490-£624 per annum, according to qualifications and experience, rising ultimately to a maximum of £689 per annum, including London Allowance in accordance with Grade 5 of the N.J.B. Agreement.

Candidates should possess a first- or second-class honours degree in engineering or physics and preference will be given to those with some research experience or knowledge of a branch of power transmission engineering.

Duties will include investigations and measurements in the field concerning damage due to corrosion and lighting.

The successful candidate may be required to pass a medical examination.

Application forms may be obtained from the Secretary's Office (Establishments), Applications Section, British Electricity Authority, British Electricity House, Great Portland Street, London W.1, and should be completed and returned to D. Moffat, Director of Establishments, not later than September 30, 1950. Please quote reference AE/91. (G 72)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the position of DEMONSTRATOR. Applicants must have had a good general education and the possession of a recognised diploma in domestic science and electrical housecraft will be an advantage. Candidates must be able to conduct lecture demonstrations both in the showrooms and on consumers' premises, and to advise consumers on the selection and use of electrical apparatus.

Salary and conditions of service will be in accordance with the National Joint Council Grade 1 within the range of £310 to £350 per annum, with further progress to £390 dependent upon a certificate of capability.

The successful applicant will be required to contribute to the Board's Superannuation Scheme, if eligible.

Applications, stating age, education, qualifications, details of training and subsequent experience, should be forwarded within 14 days. Mr. J. H. Davies, District Manager, Midlands Electricity Board, 15-17 Bridge Street, Banbury.

A. STEPHENS,
Secretary.
(G 73)

BRITISH ELECTRICITY AUTHORITY

Lands Acquisition Division,
Secretary's Office, Headquarters, London

LANDS OFFICER

THE British Electricity Authority wish to appoint a Lands Officer in the Lands Acquisition Division of the Secretary's Office at their Headquarters in London. The appointment, which is permanent and superannuable, will be made within the provisional salary range of £900 to £1,250 per annum. Applicants should have administrative or executive experience and, preferably, some knowledge of transactions in real estate and Town and Country Planning legislation.

Applicants should state their age, qualifications, experience and present salary, and give the names of two persons to whom reference may be made as to professional ability and character. Letters of application, which will be acknowledged and treated as confidential, should be sent to D. Moffat, Director of Establishments, British Electricity House, Great Portland Street, London W.1, so as to be received not later than September 22, 1950. Please mark top left-hand corner of envelope AE/90. (G 71)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of COMMERCIAL ASSISTANT (Tariffs and Statistics).

Duties will consist of the preparation and study of revenue estimates and of commercial and load statistics, preparing recommendations on supplies requiring special terms, including power and public lighting and the study and co-ordination of tariff matters. Previous experience in similar duties will be an advantage.

The salary and conditions of service will be in accordance with Grade 4 of the National Joint Council (Administrative and Clerical Grade) for the electricity supply industry, i.e. £510 to £570 per annum.

The successful applicant will be required to contribute to the Board's Superannuation Scheme if eligible.

Applications, stating details of age, qualifications, experience and present post, should be forwarded within 14 days to Mr. H. A. P. Caddell, Manager, North Staffs Sub-Area, 31 Kingsway, Stoke-on-Trent.

A. STEPHENS,
Secretary.
(G 79)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following vacancies in the System Operation Department, at St. Paul's Grid Control Area :—

(i) FIRST ASSISTANT CONTROL ENGINEER
(ii) GENERAL ASSISTANT ENGINEERS

Applicants should have had practical training and have technical qualifications up to Graduate I.E.E. standard.

The commencing basic salary for (i) will be within the range of £579, rising to £710, and for (ii) £437, rising to £569. To both will be added a London allowance of 5 per cent. with a minimum of £25 per annum. These salaries are in accordance with Class "AX," Grades 5 and 8 respectively of the N.J.B. Schedule and are subject to an ultimate maximum in Class "EX" for (i) of £799, and for (ii) of £641, plus 5 per cent. London allowance in each case.

Applications for the foregoing vacancies stating age, qualifications and experience, should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, to be received within fourteen days of the appearance of this advertisement.

J. N. WAITE,
Divisional Controller.
(G 85)

BRITISH ELECTRICITY AUTHORITY

North Eastern Division

SECOND ASSISTANT TRANSMISSION (CONSTRUCTION) ENGINEER

APPLICATIONS are invited for the appointment of Second Assistant Transmission (Construction) Engineer in the Transmission Department at Divisional Headquarters, Newcastle-upon-Tyne.

Applicants should have received a first-class technical education and have had considerable experience in the design, layout and construction of high voltage transmission systems, together with sub-stations and associated equipment.

The salary for this appointment will be in accordance with Grade 2, Schedule C, of the National Joint Board Agreement, £752-£938 per annum, and will commence at a point commensurate with qualifications and experience.

Superannuation will be in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Forms of application may be obtained from the Divisional Secretary (Establishments), British Electricity Authority, North Eastern Division, Carliol House, Newcastle-upon-Tyne, to whom they should be returned to arrive not later than September 23, 1950. (G 84)

BRITISH ELECTRICITY AUTHORITY

Chief Engineer's Department, London

SENIOR DRAUGHTSMEN

APPLICATIONS are invited for vacancies in the Drawing Office of the Chief Engineer's Department at Headquarters in London for Senior Draughtsmen, Grades A and B, with experience on power station layout, or on the layout of plant connected with power stations.

The starting salaries for the appointments, which are superannuable, will be determined according to age and experience within the following provisional ranges: Grade A £500 to £600 per annum; Grade B £600 to £700 per annum.

Application forms may be obtained from D. Moffat, Director of Establishments, British Electricity Authority, British Electricity House, Great Portland Street, London W.1, and should be completed and returned to him not later than October 2, 1950. Please quote reference AE/95. (G 69)

MIDLANDS ELECTRICITY BOARD

Wolverhampton and District Sub-Area

APPOINTMENT OF ASSISTANT CONSUMERS' ENGINEER

APPLICATIONS are invited for the above position in the Walsall District of the Wolverhampton and District Sub-Area.

Applicants should have had a sound technical training with practical experience in the sale and installation of domestic and commercial electrical equipment and the wiring associated therewith. The duties would include the supervision of contracting work, advising consumers in respect of new supplies, extensions and alterations and estimating for same. Appropriate technical qualifications will be considered an advantage.

The appointment will be in accordance with N.J.B. conditions and the provisional salary subject to negotiation will be £538 per annum.

Applications, stating age, experience and present salary, should be forwarded within fourteen days to : Mr. F. J. Elliott, Manager, Midlands Electricity Board, Wolverhampton and District Sub-Area, 85 Darlington Street, Wolverhampton.

A. STEPHENS,
Secretary.
(G 104)

CROWN AGENTS FOR THE COLONIES

ELECTRICAL ENGINEERS required by the Central Electricity Board, Federation of Malaya, for three years with prospect of permanency. Salary (including expatriation pay) payable in local currency, equivalent at the present Government rate of exchange to £742 a year, rising to £1,652 a year. Commencing salary according to age and experience. Cost-of-living allowance equivalent to between £210 and £525 a year, according to salary and dependents. Free passages. Liberal leave on full salary. Candidates, between 24 and 35 years of age, must have had a good general education and be qualified for one of the following posts :—

(a) M/N 25014(3B) ELECTRICAL GENERATION. Candidates must be Corporate Members or Graduates of the Institution of Electrical Engineers, or of the Institution of Mechanical Engineers, or possess equivalent qualifications and have had sound training in mechanical engineering with experience in the operation of medium size electricity supply undertakings. They should possess a complete knowledge of the operation and maintenance of water tube boilers, steam turbines and high and low tension switchgear.

(b) M/N 25727(3B) METERS AND PROTECTION. Candidates must be Corporate Members or Graduates of the Institution of Electrical Engineers, or possess equivalent qualifications, and have had sound practical experience in connection with the testing of meters, protective equipment, high and low voltage switchgear instruments and general testing work on a high voltage network; and be capable of planning and taking charge of a testing laboratory for an area roughly equivalent to a B.E.A. Sub-area.

Apply at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting for (a) M/N 25014(3B); for (b) M/N 25727(3B) on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (G 103)

EASTERN ELECTRICITY BOARD

Essex Sub-Area

APPOINTMENT OF DISTRICT COMMERCIAL ENGINEER—SOUTHEND

APPLICATIONS are invited for the position of District Commercial Engineer at Southend-on-Sea.

The successful candidate will be responsible under the District Manager for all commercial activities.

Preference will be given to Corporate Members of the Institution of Electrical Engineers who possess the following qualifications :—

(1) Sound engineering training.

(2) Experience in commercial development, including rates of supply.

(3) Experience in hire and hire purchase schemes, control of Service Centre sales and maintenance staff.

(4) Preparation of wiring specifications and control of wiring staff.

The salary for the appointment will be on Grade 4 of Schedule A of the National Joint Board Agreement, Southend-on-Sea District classification is at present "F," and the commencing salary would be £767 per annum.

Both future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme, and may have to undergo a medical examination.

Applications should be made in writing to the District Manager, Southend-on-Sea District, Eastern Electricity Board, Electric House, London Road, Southend-on-Sea, and should be received not later than September 30, 1950.

September 10, 1950. (G 102)

MIDLANDS ELECTRICITY BOARD

Central Gloucestershire Sub-Area, Cheltenham District

ASSISTANT CONSUMERS' ENGINEER

APPLICATIONS are invited for the above post in the Cheltenham District of the Central Gloucestershire Sub-Area. Applicants should have had a sound technical and practical training and experience in all branches of distribution work, negotiations with domestic, commercial, agricultural and industrial consumers, and planning and supervision of practical work. Appropriate technical qualifications will be considered an advantage.

The appointment will be in accordance with N.J.B. conditions, and the salary will be Class "D", Grade 10, £465 per year. It is possible that the district will enter Class "E" in the next financial year.

Applications, stating age, education, qualifications and experience, should be forwarded within 14 days to Mr. D. Holt, Manager, Central Gloucestershire Sub-Area, Midlands Electricity Board, 126 London Road, Gloucester. (G 80)

EASTERN ELECTRICITY BOARD

Chief Commercial Officer's Department

APPOINTMENT OF ASSISTANT COMMERCIAL ENGINEER—BOARD HEADQUARTERS

APPLICATIONS are invited for the appointment of Assistant Commercial Engineer at the Board's Headquarters, Wherstead.

The successful applicant will be required to assist a section head and his previous experience should include all forms of utilisation for domestic, commercial, industrial, and agricultural consumers, the negotiation of street-lighting contracts, the preparation and operation of hire-purchase and other promotional schemes, and the general administration of the commercial side of the industry.

The salary will be in accordance with Grade 2, Class "AX," of the National Joint Board Agreement, i.e. £752 to £884 per annum, and will commence at a step in that grade commensurate with qualifications and experience.

N.B.—*(This salary was wrongly given as £769 to £1,019 per annum in the issue of September 7.)*

Both future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful applicant will be required to contribute to a superannuation scheme and may have to undergo a medical examination.

Applications should be addressed to The Chief Commercial Officer, Eastern Electricity Board, Wherstead, near Ipswich, so as to reach him within 14 days of the appearance of this advertisement.

September 2, 1950. (G 49)

LONDON ELECTRICITY BOARD

VACANCY—CLERK OF WORKS

APPLICATIONS are invited for the above appointment in the Construction Branch of the Chief Engineer's Department.

Applicants must have had practical experience in the building trade or a thorough working knowledge of and experience in civil engineering work and be capable of supervising large contracts.

The commencing salary will be from £500 per annum, dependent upon qualifications and experience. This salary is provisional and subject to adjustment through the appropriate negotiating machinery.

Application forms obtainable on receipt of an addressed foolscap envelope, from Establishments Officer, 46 New Broad Street, E.C.2, to be returned not later than September 26, 1950. Please quote EST.V.951/T on envelope and all correspondence. (G 105)

APPLICATIONS are invited for the position of TECHNICAL DESIGN ENGINEER in the F.H.P. Motor Laboratory at a large electrical engineering company in the West London area. Experience of F.H.P. motor design and performance, and ability to accept full responsibility of a project from the initial design stage to factory production is essential. Applicants should possess engineering degree or equivalent qualifications. Salary will be in the region of £600 to £900 per annum, according to qualifications.—Apply, giving details of age, education, and job history, to the Employment Officer, Hoover, Ltd., Perivale, Greenford, Middx. (G 57)

ASSISTANT DISTRICT ENGINEER, Electricity Department, Singapore Municipality, is required for permanent staff. Qualifications: Graduate I.E.E. and experience electricity distribution. Basic salary scale $440-$870 per month. Starting point according to qualifications and experience. Graduated scale of allowances, e.g. present allowance on $530 p.m. basic are: expatriation $110 p.m., plus cost of living $186 p.m. for single man, or $235.50 for married man or $301.50 for married man with family. One Malayan dollar equals 2s. 4d. Thus married man with family on basic salary of $530 p.m. would draw equivalent of £1,318 per annum. Quarters with heavy furniture provided at 8 per cent. of salary or allowance in lieu. Initial appointment on three years' agreement. Eight months leave after four years' service. Free medical attention. Passages paid, including family (children under 17). Compulsory Provident Fund contributions of 7½ per cent. of salary and Municipal Commissioners donate 7½ per cent., rising to 20 per cent. after 20 years' service. Applications in duplicate, with full personal and technical information, and copies of three testimonials, to Messrs. Peirce & Williams (agents to the Municipal Commissioners), 1 Victoria Street, London S.W.1, before October 4, 1950. (G 65)

COMPANY manufacturing selenium metal rectifier equipments in Boreham Wood, Herts, have vacancy in Design Office for ELECTRICAL ENGINEER, age 25-35, with H.N.C. or equivalent. Write, giving age, details of experience and salary required, to Box No. 1683, Electrical Times. (G 62)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

URGENTLY REQUIRED

POWER STATION CHARGE ENGINEERS

by major oil company for service in the Middle East. Applicants must hold at least Higher National Certificate in Electrical Engineering and have had not less than three years' experience in the operation of large modern Steam Power Stations with thorough knowledge of the routine operation of water-tube boilers, turbo-alternators, E.H.T. switchgear and auxiliary plant. Present position in this country should be not less than Grade 8a, Class "H" or Grade 8, Class "G" on N.J.B. Scale. Age not over 35 years. Married accommodation available. Commencing salary not less than £900 per annum PLUS an allowance in the local currency which is liable to variation but which at the present time is equal to £1,400 per annum. Free passages out and home, free medical attention, kit allowance, good leave arrangements, excellent Pension Scheme. Write giving age, personal particulars and full details of qualifications and experience, quoting Dept. F.189, to

Box No. 2550 at 191 Gresham House, E.C.2

(E 284p)

DRAUGHTSMAN with experience of large transformer manufacture required by electrical engineering company in North-East London. Permanent position, with superannuation scheme, for suitable applicant. Good salary and working conditions. Write, stating age, experience and salary required, to Box No. 1685, Electrical Times. (G 63)

DRAUGHTSMAN, age 22-23, for detailing small mechanism. Interesting work; good conditions.—Write, giving full details of experience, etc., to Box No. 1671, Electrical Times. (G 13)

DRAUGHTSMEN with experience in the fabrication of large steel tanks and vessels required by electrical engineering company in North-East London. Permanent position, with superannuation scheme, for suitable applicants. Good salary and working conditions.—Write, stating age, experience and salary required, to Box No. 1687, Electrical Times. (G 64)

DRAUGHTSMEN, with knowledge of general electrical design work. Workshop training desirable. Permanent position with superannuation scheme. Salary according to age and qualifications.—Apply, in writing, to the Staff Officer, British Insulated Callender's Cables Ltd., Prescot, Lancs. (G 97)

ELECTRICAL DEVELOPMENT ENGINEER required by major British oil company for service in the Middle East in connection with industrial layouts and distribution schemes. Applicants must be graduates of the Institution of Electrical Engineers or equivalent, and practical electrical engineering experience on construction duties in steel works, collieries, or similar plant is desirable. Maximum age limit, 35. Attractive salary, plus generous allowance in local currency, free passages out and home, kit allowance, free medical attention, good leave arrangements, pension scheme.—Write, stating personal particulars and full details of qualifications and experience, quoting Department F.208, to Box No. 2949, at 191 Gresham House, E.C.2. (G 92)

ELECTRICAL DRAUGHTSMAN required for work on new distribution system with possibility of permanency for suitable man. Experience of large industrial plant electrical layouts, diagrams and specifications is desirable.—Applications, giving age, personal particulars and experience, to be addressed to National Oil Refineries, Limited, Llandarcy, Neath, Glamorgan. Envelope to be marked "Electrical Draughtsman." (F 727)

ELECTRICAL ENGINEERS required by major British oil company for several months' training in U.K. in power-station work for eventual service in the Middle East. Minimum qualifications: Higher National Certificate in Electrical Engineering, with one year's industrial experience. A salary is paid while in U.K., together with contribution to cost of living if away from home. Overseas posts offered to successful trainees will carry attractive salary plus a generous allowance in the local currency, free passages out and home, free medical attention, good leave arrangements, pension scheme.—Write, giving personal particulars and details of qualifications and career to date, quoting Department F.198, to Box No. 2946, at 191 Gresham House, E.C.2. (G 93)

ELECTRICAL DRAUGHTSMAN required by major oil company for service in the Middle East. Must have served five years electrical engineering apprenticeship, and have had five years D.O. experience in connection with electrical layouts of large industrial plants with underground cable networks. Should possess Higher National Certificate. Graduate or associate membership of a corporate engineering body desirable but not essential. Maximum age limit 35 years. Attractive salary plus generous allowance in local currency. Free passages out and home, free medical attention, kit allowance, good leave arrangements. Pension scheme.—Write, giving personal particulars and details of qualifications and experience, quoting Dept. F.192, to Box No. 2809, at 191 Gresham House, Old Broad Street, E.C.2. Applicants without above requirements will not be considered.(F 322)

ELECTRICAL ENGINEER to manage contracting department.—Giffords, Ltd., Basingstoke. (G 89)

ELECTRICAL wiring accessories. CHIEF DESIGNER wanted to take charge of development and engineering in an established organisation in the London area. Applicants should have had several years' experience in a responsible position of design work in both its electrical and mechanical aspects.—Write, giving full details of past experience and salary required to Box No. D.9038, A. K. Advg., 212a Shaftesbury Avenue, W.C.2. (G 96)

ENGINEER AND MANAGER for electrical contractor's business London. Must have held similar position. Capable estimating, supervising, interviewing. Applications strictly confidential. Commencing salary £1,000 with prospects.—Write, stating age, qualifications, experience and copies of testimonials, Box No. 452, Dorland Advertising Ltd., 18 Regent Street, London W.1. (G 86)

EXPERIENCED LINESMEN required for power line construction work in all parts of the British Isles. Rates of pay in accordance with Civil Engineering Construction Conciliation Board's agreement.—Please apply, in writing, to Contract Department, Henley's Telegraph Works, 51/53 Hatton Garden, London E.C.1, giving details of recent experience and employers. (F 772)

HOOVER, LTD., have a vacancy for a SENIOR PLANNING AND METHODS ENGINEER, who must have had extensive experience in the mass production of light press work. Tool design and modern production experience is essential.—Write, giving full details of training, experience, and age, to The Employment Officer, Hoover, Ltd., Perivale, Greenford, Middx. (G 58

LARGE manufacturing firm, producing electric cooker and domestic appliances, will shortly be appointing a SENIOR SALES REPRESENTATIVE for the Midlands area. This important position is a permanent and progressive one and carries with it a retiring pension. Men of good education with sound electrical background, knowledge of the products and actual sales experience are invited to apply, in writing, giving full details of experience and salary required to Box No. 1659, Electrical Times. (F 783)

LIFT LAYOUT DRAUGHTSMAN wanted. Good wages, plus bonus.—Apply, Marryat and Scott, Ltd., Wellington Works, Hounslow. (F 744)

MAINS FOREMAN required at Bridgwater. N.J.I.C. conditions and rate of pay (39d. per hour).—Detailed applications to H. G. B. Dickinson, Esq., M.I.E.E., District Manager, South Western Electricity Board, Electricity Offices, Mount Street, Bridgwater. (G 74)

POWER-PLANT consulting engineers require SENIOR ENGINEER ASSISTANT, with good knowledge of power station layout and design for London office.—Apply, with full details of technical and practical experience and state salary required, to Box No. 794, T. and G., 101 St. Martin's Lane, W.C.2. (G 95)

MERSEY CABLE WORKS LIMITED

BOOTLE, LIVERPOOL 20

Cable Sales Engineer

required for Midland area to develop sales of rubber insulated cables. Applicants must have an intimate knowledge of rubber cables, and preferably a good connection with commercial, industrial, electricity supply and municipal undertakings.

Applications, giving details of experience, age, and salary required, should be sent to:

Mersey Cable Works, Ltd., Linacre Lane, Bootle, Liverpool 20. (G 40p)

POWER-STATION ENGINEER, fully qualified and with at least five years' practical experience, required by British-managed company in India. Age 27-28. Commencing salary approx. £1,150 p.a. Free quarters, medical attention and passages provided. Pension scheme. Applications in writing, giving full details of qualifications and experience to Box No. 3658, c/o Charles Barker & Sons, Ltd., 31 Budge Row, London E.C.4. (G 68)

SENIOR AND JUNIOR ELECTRICAL DESIGNERS experienced in all classes of a.c. and d.c. dynamo electric machines from 5 to 5,000 h.p./kW. Five-day week. Superannuation scheme in operation. Applications, stating age, experience and salary expected, to Personnel Manager, Lancashire Dynamo & Crypto, Ltd., Trafford Park, Manchester 17. (G 5)

SENIOR ELECTRICAL DRAUGHTSMEN required by established British firm with American affiliation. Experience of power distribution and lighting installations, as applied to the Oil Refinery and Chemical Industry, essential. Qualifications to H.N.C. Standard. Substantial salaries will be paid to suitable applicants.—Write, stating age, qualifications and experience, Foster Wheeler, Ltd., 3 Ixworth Place, London S.W.3. (F 786)

SENIOR JIG AND TOOL DESIGNERS required for extensive tooling programme. Experience of modern methods in mass production essential. Applicants must have an apprenticeship and National Certificate (Mechanical) would be an advantage.—Write, giving details of age, qualifications, and experience, to The Employment Officer, Hoover, Ltd., Western Avenue, Perivale, Greenford, Middx. (G 59)

SHOWROOM SALES. Electrical contractors with large modern showrooms require staff, male or female, fully experienced in electrical retail trade and knowledge of electrical appliances and fittings. Capable of displaying apparatus and window dressing. Excellent salary and good prospects to suitable applicant.—Reply, with all details, age, etc., to J. W. Russell, Ltd., 18 Queens Road, Watford. (G 94)

TECHNICAL ASSISTANT required for London with experience of overhead transmission and distribution lines and up to Higher National Certificate standard in electrical and civil engineering. Salary according to qualifications and experience.—Apply in writing to the Staff Officer, British Insulated Callender's Construction Co., Ltd., 21 Bloomsbury Street, London W.C.1. (G 91)

THE Brush Electrical Engineering Co., Ltd., Loughborough, require additional SENIOR TRANSFORMER DRAUGHTSMEN for their drawing office extension. Preference will be given to men having experience of the layout of large transformers. A number of vacancies also exists for JUNIOR TRANSFORMER DRAUGHTSMEN and applications are invited from keen men desirous of obtaining progressive positions. In both instances applicants should write, giving full details of experience, age, etc., to the Technical Director. (G 76)

TO accommodate present expansion, an old-established engineering company invites applications from established SALES ENGINEERS to fill immediate vacancies in the Midlands, Manchester, and London areas. Preference will be given to men of outstanding personality and experience in the sale of rotating electrical machinery up to 100 h.p. The situations are responsible and progressive, with corresponding remuneration to the right men.—Box No. 1661, Electrical Times. (G 39)

TRANSFORMER DRAUGHTSMAN. An experienced Senior Draughtsman urgently required, capable of handling work up to 5,000 kVA.—Applications, stating age, experience, training, and salary required, should be addressed to Employment and Welfare Manager, Johnson and Phillips, Ltd., Victoria Works, Charlton, London S.E.7. (G 42)

TRANSFORMER DRAUGHTSMAN, fully conversant with power transformer construction up to 2,500 kVA, 33 kV, required by a progressive company in South Wales. A house will be available for the successful applicant.—Box No. 1675, Electrical Times. (G 23)

VACANCIES exist for PRODUCTION INSPECTORS at various Admiralty establishments for duties in connection with the manufacture, inspection, test and installation of mechanical and electrical apparatus and radio equipment for H.M. Ships.

Candidates, who should be at least 25 and preferably not more than 35, should have served a recognised engineering apprenticeship or equivalent training followed by a minimum of three years' relevant experience in industry or in Government service and should preferably be in possession of Higher National Certificate or equivalent. A lower qualification such as the Ordinary National Certificate might, however, be considered.

Appointments will be temporary but there may be opportunities at a later date of competing for permanent posts. The salary scale is £500 by £20 to £625 per annum and entry will be at the minimum, subject to a deduction of £20 for each year by which the age of entry falls short of 30. Rates outside London are a little lower.

Write, quoting D.374/49-A, to the Ministry of Labour and National Service, Technical and Scientific Register, (K) York House, Kingsway, London W.C.2, for application form, which must be returned completed by October 14, 1950. (G 109)

TRANSFORMER ESTIMATOR and Technical Correspondent urgently required. Must be capable of dealing with tenders for home and overseas business; practical experience an advantage.—Applications, stating age, experience, and salary required, should be addressed to Employment and Welfare Manager, Johnson and Phillips, Ltd., Victoria Works, Charlton, London S.E.7. (G 43)

WELL-KNOWN electrical accessory manufacturers require REPRESENTATIVE for the South Wales and South-West England areas. Applicants must have established connection amongst electrical wholesalers, contractors, public supply authorities, and B.E.A. Car owner essential.—Write, giving full particulars of experience, qualifications, and salary expected, to Box No. 1673, Electrical Times. (G 14)

YOUNG ENGINEER required for contracts department by manufacturers of electrical instruments and light switchgear. Near London.—Box No. 1689, Electrical Times. (G 87)

APPOINTMENTS WANTED

ELECTRICAL ENGINEER, 20 years' experience in electrical engineering and contracting, seeks progressive appointment in commercial or engineering section of the industry at home or overseas.—Box No. 1651, Electrical Times. (F 764)

WORK WANTED

A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed.—Edgware 8631 (4 lines), Service Electric Co., Ltd., Stanmore, Middx. (D 324)

ARMATURE SERVICE CO., LTD., Haddington Street, Hove (Tel. 32996), electrical engineers and winding specialists. Distance no object. (F 739)

CASTINGS, Fisher Foundries, Ltd., Greet, Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham, Victoria 0197. (F 270)

GUARANTEED, high quality Stator and Armature Re-winds, F.H.P. motors, portable tools, etc. Contract rates available.—Sarum Electric, Ltd., Brown Street, Salisbury. Tel. 4245. (G 52)

ZEROS REFRIGERATORS.—Complete range of repair and service now available. Equipment reconditioned to conform to pre-war manufacturers' specifications.—Time Engineers, Refrigeration Specialists, 60 Southend Road, Rainham, Essex. Tel.: Rainham 2358; or Southern Area Agency. Tel.: Springpark 4217. Electrical Spares supplied to the trade. (A 239)

WANTED

A.C./D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Phone: Chiswick 5105. (A 20)

BROOKHURST floor-mounted pillar type STARTERS d.c. 230 V. One 50 h.p., one 5 h.p., one 250 h.p. (any offer against this particular item to be contactor operated or similar type). All starters to be fitted with inherent no-volt and overload release trip protection. One Brookhurst pillar-mounted hand or auto 400 V, 3 ph, 50 c/s star-delta starter, 65 h.p.—Box No. 1693, Electrical Times. (F 765)

DIESEL ALTERNATOR, reconditioned, 6-8 kW, 230 V, 1 ph., 50 c/s. Also 1,500 W, 230 V Generator, with automatic starting equipment. State price and particulars.—Durrant, 27 Elmhurst Drive, Ipswich. (G 101)

SCRAP ACCUMULATOR PLATES and Sediment wanted, any quantities. Also Storage Batteries purchased and dismantled.—Phone or write Elton Levy Co., Ltd., St. Ermin's (West Side), Caxton Street, London S.W. Phone: WHitehall 9621/2/3. (A 3)

WANTED.—D.C. and a.c. ball-bearing MOTORS.—Full details to Britannia Manufacturing Co., Ltd., 22/26 Britannia Walk, London N.1. (A 13)

WANTED, ROTARY CONVERTERS, any size.—Universal, 221 City Road, London E.C.1. (A 16)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady St., Bethnal Green, E.1. (A 1)

WANTED, TIME SWITCHES of good make. In or out of order.—J. W. Hughes, Clockwork Engineers, 3 St. Thomas' Street, London Bridge, S.E.1. Phone: HOP 2759. (G 2)

WANTED.—Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube Boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube Boilers for dismantling. —Apply, giving full details to Midland Iron and Hardware Co., Cradley Heath. (A 5)

AGENCIES

MANUFACTURERS' AGENTS ASSOCIATION, INC. (E.T.), 8 Bream's Buildings, London W.C.2, supplies free lists of Agents to Manufacturers seeking representation in important industrial centres. Membership available to established agents only. Particulars supplied. (A 7)

FOR SALE

By Order of the Minister of Supply

G R

AUCTION SALE AT
NO. 14 M.U., R.A.F., CARLISLE NO. 7 SITE,
BLACKWOOD, LONGTOWN
9 miles north of Carlisle.
THURSDAY, SEPTEMBER 28
11 a.m. Useful Assortment of
ELECTRICAL AND INDUSTRIAL MACHINERY, EQUIPMENT, STORES, AND GENERAL SUNDRIES
including 9 Mobile Diesel-driven Generating Sets, 18 kW; also Compressors, Fans, Motors, Transformers, Regulators, Control Panels, Pumps, Electrical Sundries, Photographic Goods, Tools, Building Sundries, Portable Organs and Typewriters, Compasses, Clocks, Watches, Clothing, Fabrics, Footwear, Paints, etc.

Viewing, Wednesday, September 27, 9 a.m. to 4.30 p.m., and on sale morning, 9 to 11 a.m.

Catalogue, 6d., from the Auctioneers:

HARRISON AND HETHERINGTON, LTD.,
Carlisle.

Tel. 1792 3. Telegrams: "Sales." (G 90)

CABLES & WIRE

FOR immediate disposal: quantity of EMPIRE TAPE, 1 in. x 50 yd, straight cut, waxed and guaranteed in 100% perfect condition. Wrapped in packets of 10. Price 5/- per roll. Min. order 50 rolls. Also 300 coils asbestos-covered COPPER COOKER WIRE, 16 s.w.g. by 100 yd, manufac. by Sterling Cable Co. Price 25/- coil.—Wylan Equipment Co., 37-39 Houldsworth Street, Manchester 1. CENtral 7734. (G 108)

TELEPHONE WIRE, Don. 8, price 15s. per 56-lb. drum, containing ¼-mile twin.—Bradfords, Ramsey, Essex. (F 682)

DOMESTIC APPLIANCES

COMMERCIAL IRONS for all purposes.—Donaldsons Wireless Electric Irons, 31 Sloan Street, Leith. (A 163)

IMMERSION HEATERS, Grubb 2 kW and 3 kW standard voltages, all lengths, 12 in. to 36 in. Also 4 kW (non-taxable), 16 in. to 36 in. Fully guaranteed and immediate delivery. For illustrated brochure, latest lists and trade terms write distributors, John Owner and Co., Springfield Road, Birmingham 13. Tel.: Spr. 2389. (C 392)

ENGINEERING PLANT & MATERIALS

ALUMINIUM ALLOY, new polished flat sheets, size 6 ft by 3 ft by 24 gauge, £9 15s. per dozen. Corrugated Sheets, 6 ft by 3 ft by 24 gauge, £9 9s. per dozen. All prices carriage paid. Delivery ex-stock.—Sawyers Manufacturing Company Limited, Bures, Suffolk. Tel.: Bures 351/2. (F 552)

FOR SALE, one geared travelling-type Morris Electric HOIST BLOCK, 230-V, d.c. Clear lift of 22ft 8in., working load 1 ton. In good working condition.—London Brick Co., Ltd., Africa House, Kingsway, London W.C.2. (F 755)

SOUTH EASTERN ELECTRICITY BOARD

TENDERS are invited for the following unused Thermal Storage equipment now lying at Queens Hospital, Croydon, Surrey. The equipment will need to be dismantled and removed from site by the successful tenderer within one calendar month of the acceptance of the tender.

Two 2,000 kW 6.6 kV electrode boilers (Messrs. A. Reyrolle and Co.); two control panels for above; four alarm bells; two 6-in. motorised valves; two 5-in. motorised valves; two 3-in. motorised valves; two ¼-h.p. 1,450 r.p.m. 3-ph. 400 V motors; two 25,200-gall steel cylinders, ¼-in. plate, 12-ft dia, 37 ft 6 in. long; two 6,200 gall calorifiers, 5/16-in. plate, 8 ft dia, 12 ft long; two 6-in. centrifugal pumps; two 1¼-in. centrifugal pumps; two 7-in. wheel valves; nine 6-in. wheel valves; two 5-in. wheel valves; four 3-in. wheel valves; four 2-in. wheel valves; two 1¼-in. wheel valves; 95 ft 6-in. pipe; 27 ft 5-in. pipe; 15 ft 4-in. pipe; 15 ft 3-in. pipe; 52 ft 2-in. pipe; 44 ft 1¼-in. pipe; sundry fittings.

Full particulars can be obtained from the District Manager, A. E. Hawkins, Esq., B.Sc.(Eng.), A.M.I.E.E., Electric House, Wellesley Road, Croydon, Surrey. Tel. No. Croydon 4499, with whom arrangements to inspect can also be made.

Tenders, which must be submitted in plain envelopes endorsed "Tender for Thermal Storage Equipment," must reach the undersigned not later than Monday, October 16, 1950.

The Board does not bind itself to accept the highest or any tender received.

A. L. BURNELL,
Secretary.

10 Queen's Gardens,
Hove 3, Sussex.
September, 1950. (G 83)

LADDERS (wooden and aluminium, all types), Trestles, Steps, Handcarts, etc., from Ramsay and Sons (Forfar) Ltd., Forfar (Tel. 172). (C 603)

WELDING PLANT. Several Motor Generator Arc Welders, single, double and multi-operator up to 600 amps, input 400/440 V, 3-phase, 50 cycles. Also several single and double operator oil-cooled transformer welders. All modern units by well-known makers. Attractive prices.—Full details write: Thos. W. Ward Ltd., Albion Works, Sheffield. (E 111)

GENERATING PLANT

ALTERNATORS from stock, 400/440 V, 3-phase, 50 c/s, with Exciters and switchboards. 80 kVA "GEC" 1,000 r.p.m. 40 kW "ECC," 750 r.p.m. 28 kVA "Crom-Park," 1,500 r.p.m.—Full details, write: Thos. W. Ward Ltd., Albion Works, Sheffield. Phone 26311 (ex 347). (E 109)

DIESEL ALTERNATOR SETS in stock, standard voltages, single and three phase. Details post free on request.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Tel. 26311 (ex 347). (E 108)

DIESEL GENERATOR made by Ailsa Craig, capacity 60 kW, complete and in working condition on fabricated bed, with self-starter, battery, switchgear, etc. Price £245 on site.—Maurice Jellinek, Ltd., Ferryside Works, Thames Ditton. Emberbrook 3482. (G 75)

STEAM-DRIVEN GENERATING SETS. 2,500 kW (3,125 kVA) pass out turbo-alternator set by Howden Siemens, for 480/3/50, speed 3,000 r.p.m. Steam pressure 195 lb sq in., temp. 510 deg. F, passing out 50,000 lb steam per hr at 40 lb pressure. Mirrlees surface condenser and condenser pump.

700-kW geared turbo-alternator set by W. H. Allen-Crompton Parkinson, for 440/3/50, 4-wire, 0·8p.f., speed 6,000/1,000 r.p.m., through reduction gear. Turbines designed for steam at 280 lb sq in., against 30 lb back pressure superheat 50 deg. C, steam consumption 4·17 lb per kW hr. Alternatively 200 lb sq in., 10 lb back pressure, steam consumption 42 lb kW hr, then giving max. output of 620 kW. Overhauled by makers 1948. Can be reconnected for 220/3/50.

Two 600-kW (750 kVA) geared turbo-alternator sets by G. and J. Weir-E.C.C., for 400/440/3/50, 4-wire, speed 4,000/1,000 r.p.m. through David Brown reduction gear. Steam pressure 150 lb sq in., 15 lb back pressure, suitable for pressures up to 190 lb sq in. With switchboard and direct coupled exciter.

Three 500-kW geared turbo-alternator sets by W. H. Allen-Crompton Parkinson, for 440/3/50, 4-wire, 0·8p.f., speed 6,000/1,000 r.p.m., through reduction gear. Turbines designed for steam at 280 lb sq in. against 30 lb back pressure, superheat 50 deg. C., steam consumption 37·5 lb per kW hr. Capable of full output with steam at 200 lb sq in., 10 lb back pressure, steam consumption 37 lb per kW hr. Overhauled by makers 1948. Can be reconnected for 220/3/50.

George Cohen Sons and Co., Ltd., Wood Lane, London W.12. Tel.: Shepherds Bush 2070; and Stanningley, nr. Leeds. Tel.: Pudsey 2241. (G 78)

MOTOR GENERATING SETS. Built to customers' requirements of new and used plant. Many in stock at Wembley, inspection invited. Please send us your inquiries. We can help you to save time. Over a THOUSAND MACHINES ALWAYS IN STOCK.—Dynamo and Motor Repairs Ltd., Wembley Park, Middlesex. Telephone: Wembley 3121 (4 lines). Also at Phoenix Works, Belgrave Terrace, Soho Road, Birmingham. Telephone: Northern 0898. (A 2)

ONE MOTOR GENERATOR SET, maker: L.D.M., input 400 V 3 ph 50 c/s, ouput 110 V, alternatively 230 V, 205 kW. The set comprises synchronous induction motor direct coupled on common cast iron base plate to compound wound d.c. generator.—Further particulars apply to Box No. 1665, Electrical Times. (F 766)

ONE L.D.M. 290 kVA, 250 r.p.m. revolving field type ALTERNATOR.—Oldfield Engineering Co., Ltd., 96 East Ordsall Lane, Salford 5. (F 773)

THE Electroplant Co., Wembley, for any type of special duty electrical plant. Specialities: CONVERTORS, GENERATING SETS, ELECTRICAL TEST EQUIPMENT. Ask for production range. (E 445)

1 ALTERNATOR, G.E.C. 6,500 kW 0·9 power factor 6·6 kV 3-phase 50 c/s, at 500 r.p.m. Two-bearing Alternator, complete with exciter and bed plate together with panel.—Apply: C. J. Rice, 137 Mayplace Road West, Bexleyheath, Kent. Tel.: Bex. 3282. (F 494)

100-kVA MODERN DIESEL ALTERNATOR SET, comp. Vert. 6-cyl. Diesel engine direct coupled to alternator on baseplate. 400/230 V, 3-phase, 50 cycles, 4 wire. Details on request.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Tel. 26311 (ex 347). (E 112)

LIGHTING EQUIPMENT

ELECTRICAL industries greatest value: 5 ft V-type FLUORESCENT FITTINGS with built-in control gear, £2 19s. 6d. complete, less tubes. Send 1d. stamp for lists.—Northern Industries, Snow Hill, Manchester 4. (D 50)

FLUORESCENT LAMPS AND CHOKES, Neon and other special lamps. British and American. Inquiries invited.—Suplex Lamps Ltd., 239 High Holborn, London W.C.1. (G 106)

FLUORESCENT LIGHTING. 80-W 5 ft Batten Fitting, white stoved, with guaranteed ballast, fully tested 210-240 V a.c., complete with tube; dispatched to trade only. 3 gns. carriage forward.—Malden Transformer Supplies, opposite G.P.O. George Street, Richmond, Surrey. (G 107)

FLUORESCENT SHELLS.—High quality stoved troughs 14s. 9d. Hexagon battens 17s. 6d., others pro rata. Complete fittings fully guaranteed at very competitive prices.—Cowling and Holdsworth, No. 1 Factory, Romside Trading Estate, North Street, Romford 7262. (F 63)

PURLEY CHOKES AND BALLASTS. Silent operation, excellent performance, efficient, long life, vacuum impregnated, quick delivery. Low price (e.g. Purley Queen, 80 watts, 14/6 each, less quantity and cash discounts). Quotations for export.—F. W. Blanshard, Ltd. (Dept. ET), Purley, Surrey. (E 343)

METERS

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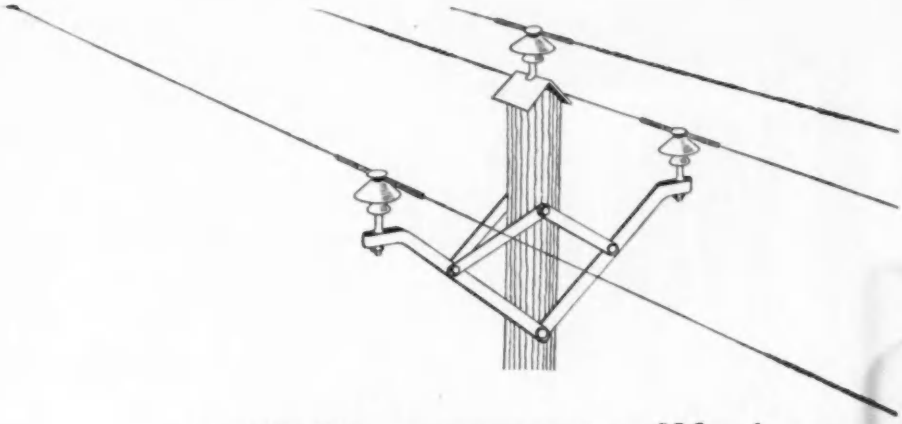

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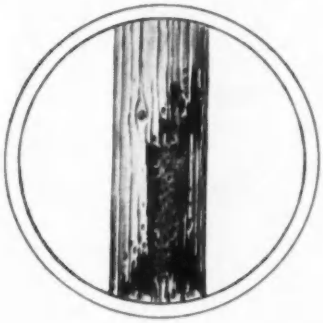

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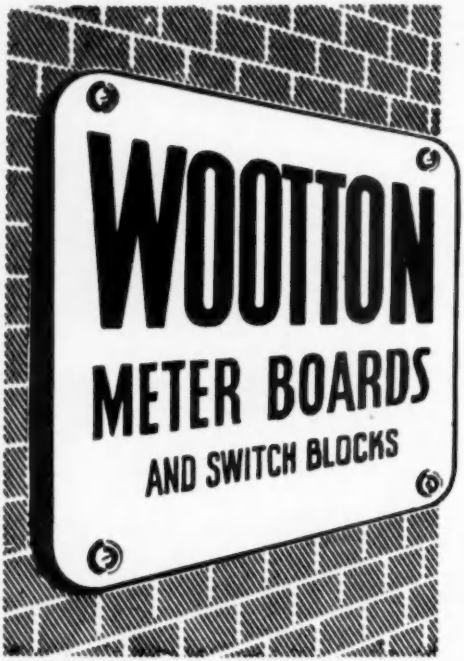

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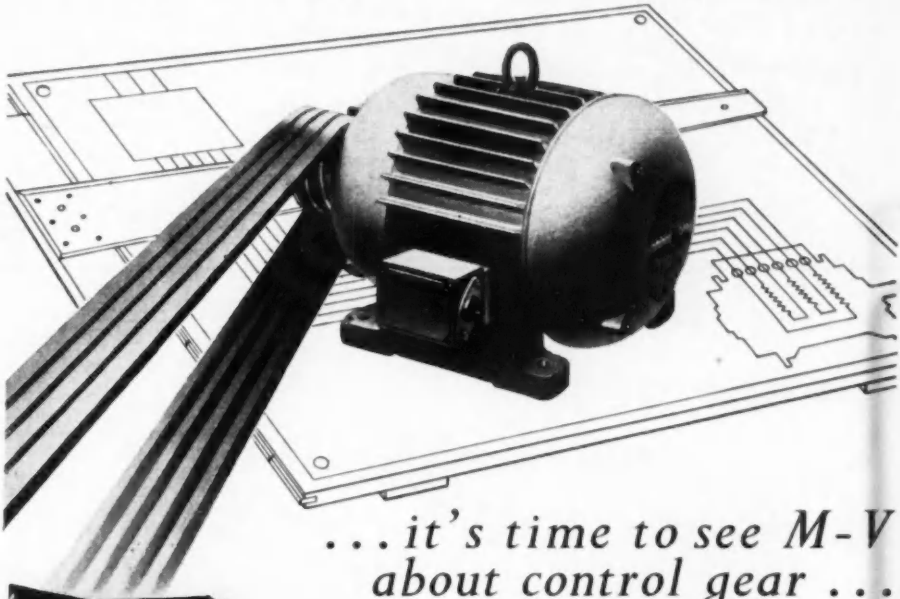

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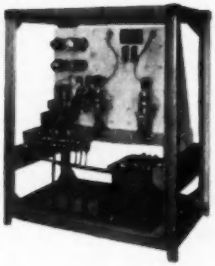

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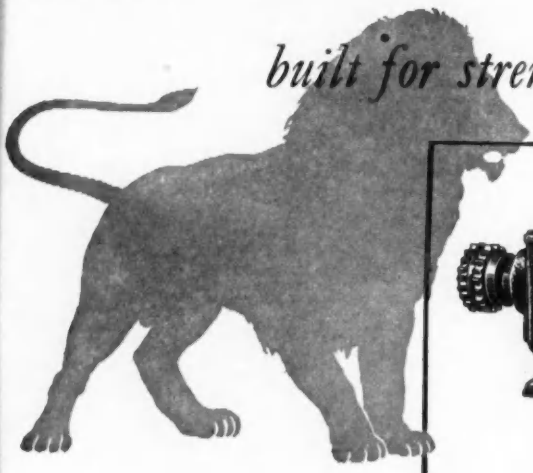

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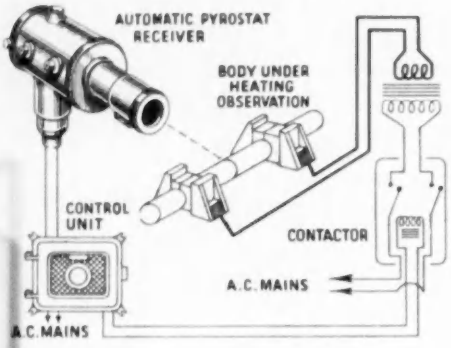

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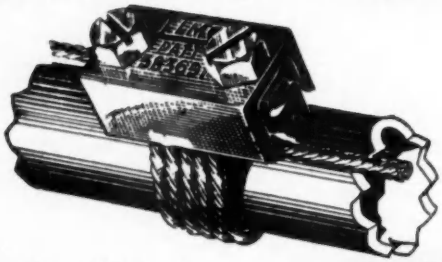

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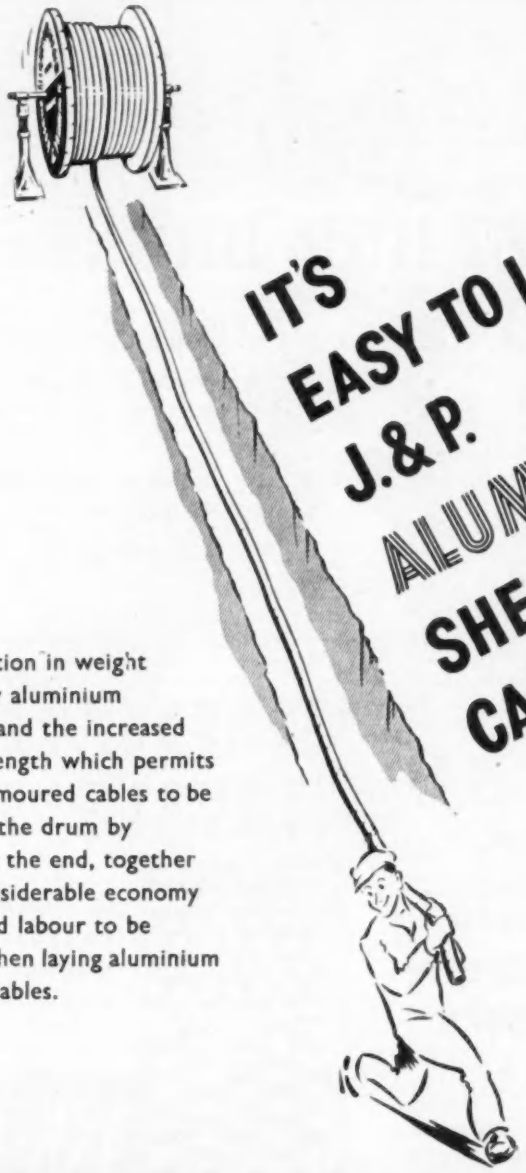

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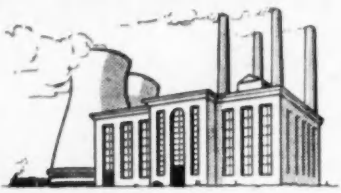

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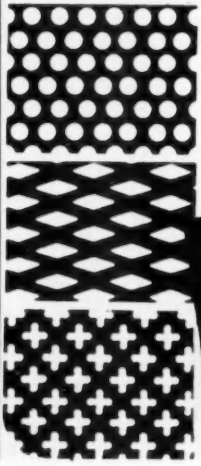

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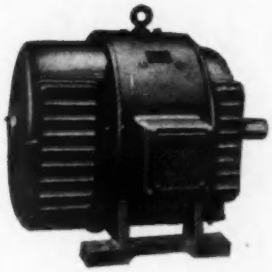

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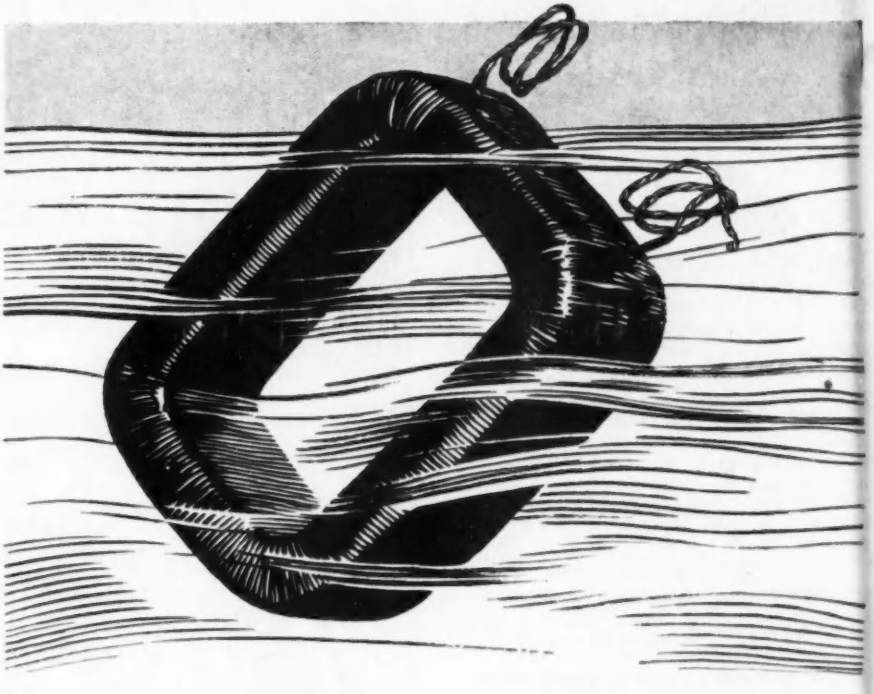

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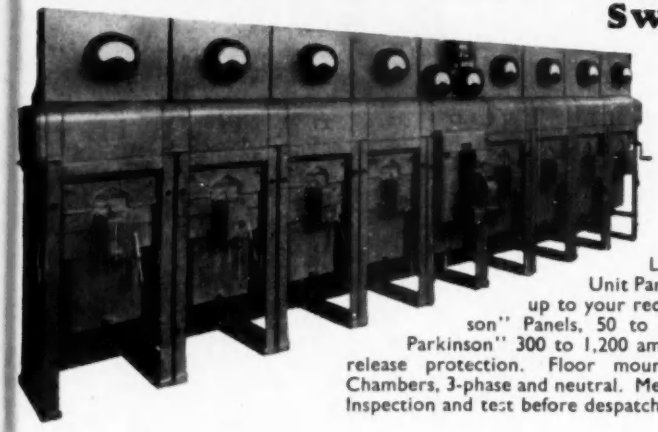

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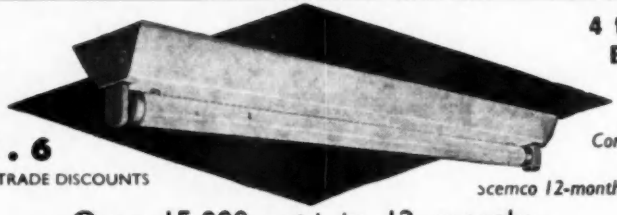

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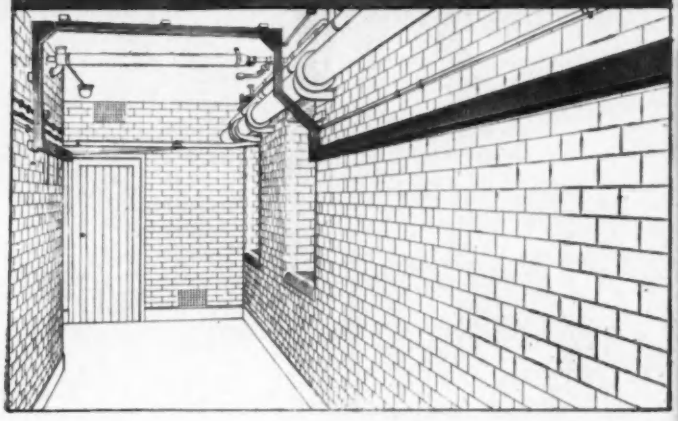

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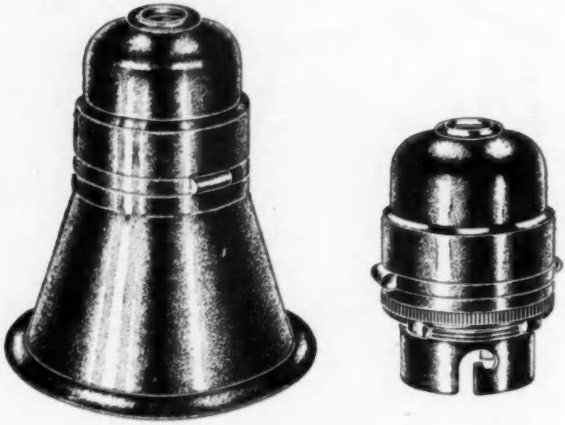

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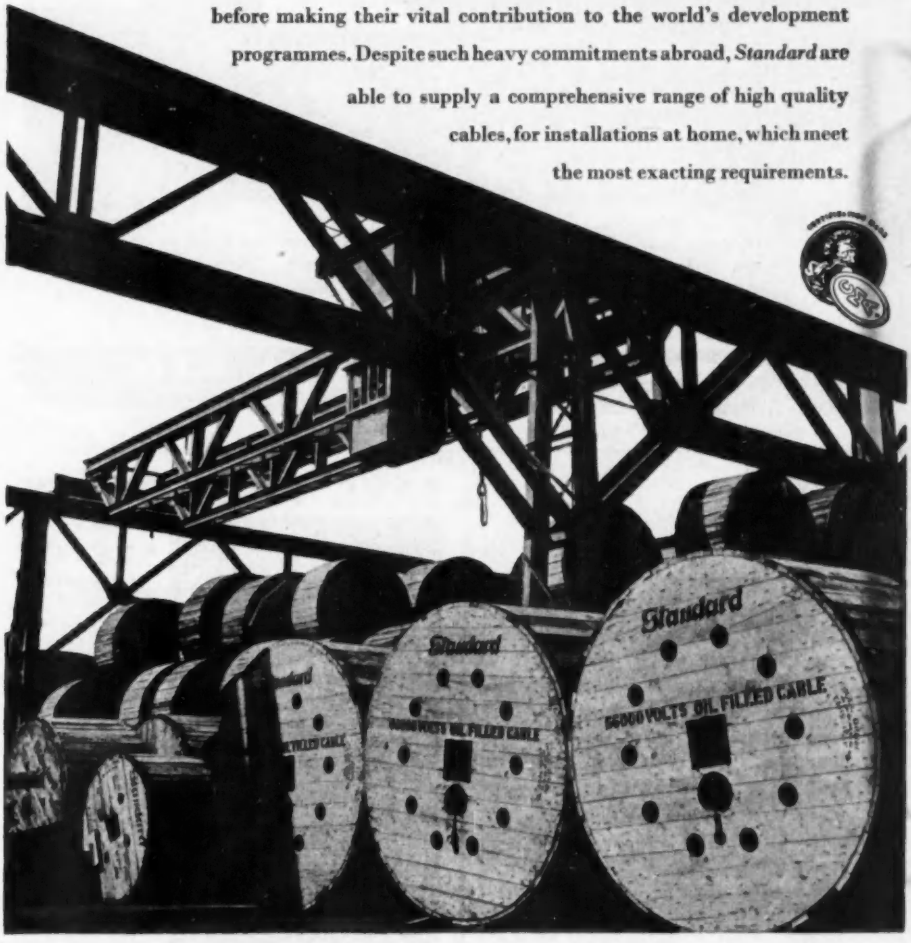

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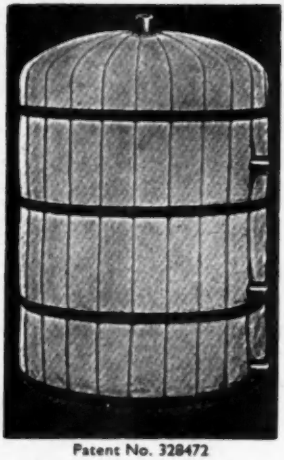

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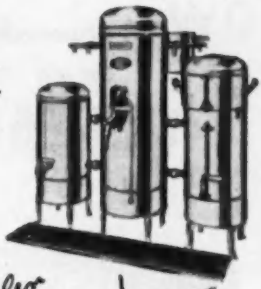

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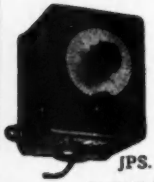

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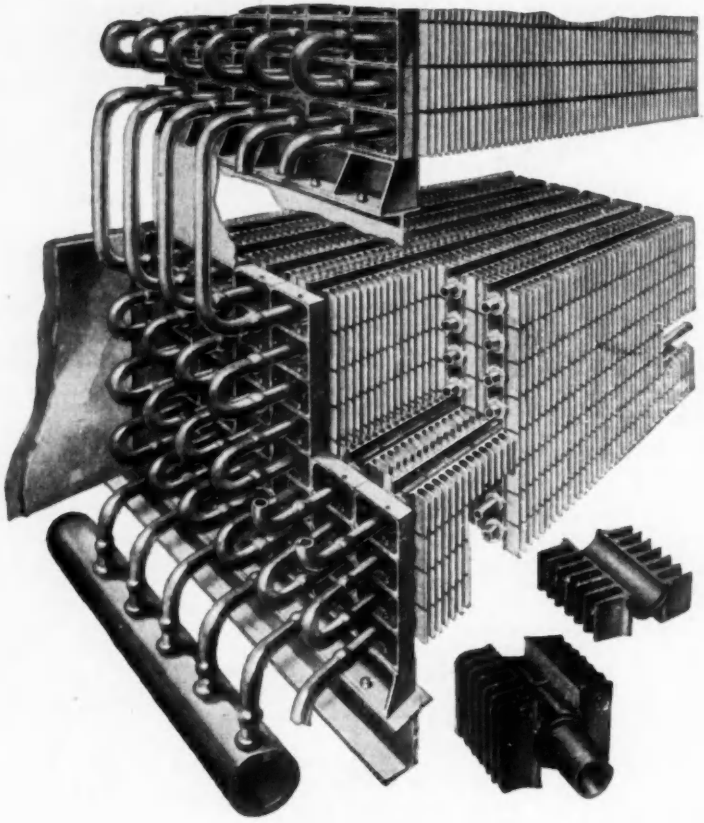

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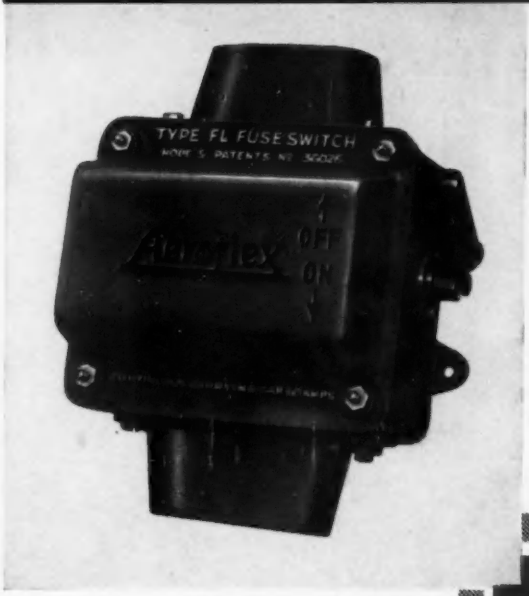

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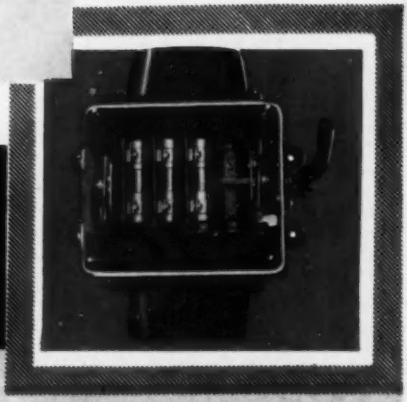

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